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THE BRICKBVILDER

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THE BRICKBUILDER.

AN ILLUSTRATED MONTHLY DEVOTED TO THE ADVANCEMENT OF ARCHITECTURE IN MATERIALS OF CLAY.

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HONOR TO WHOM HONOR IS DUE.

BETWEEN the financial necessity of making himself known, and the unwritten ethical code which forbids him to advertise his wares, the architect is not uncommonly squeezed out of a proper recognition of himself as a factor of his work. Now there is a right and a wrong use to make of an architect's name in connection with building operations. To parade the fact in print that so and so has done so and so, when his achievements are of little public interest or real merit, is certainly reprehensible. On the other hand, the architect has a perfect right to an acknowledgment of what he has done, and he is entitled to this recognition as publicly as the circumstances will warrant. When we read in the news columns a report of the dedication of some church or of some proposed public building, with a dozen or more names of committee men unknown to fame, we fail to see who, beyond a very narrow circle of personal friends, would be interested in such names; while the name of the architect, which is very apt to be lacking, is of deep business interest as well as of artistic importance to a great many. This is a principle which the public as represented by the utterances of the daily press is very apt to neglect, not with the idea of depriving the architect of what might be considered an advertisement, but because the desirability of coupling the man and his work does not appeal to the average news editor. When it is remembered that in a large building direct employment is given to many thousand craftsmen and artists, and that each one of these looks to the architect of ten for direct employment and always for possibilities of gain, it will readily be seen that the omission of the architect's name considered simply as a matter of news is a mistake, and that the thousands of manufacturers, mechanics, and contractors who have to do with the building have quite as much interest in knowing who is to do it as they have in knowing what is to be done. In connection with a large structure recently completed, it was estimated as a result of pretty careful investigation that the building had directly and indirectly interested something over three thousand people in its construction, each one of whom received his instructions and final approval of work from the architect. Surely in a case of that kind the mention of an architect's name, no matter how publicly brought forward, could hardly be called illegitimate advertising.

The association of the name with the work may properly be carried even further. When a painter signs his canvas, or a sculptor carves his name on the pedestal of a statue, no one considers that he is exploiting himself before the public. It is expected as a matter of course, quite as naturally as that an author shall sign his writings. There has recently been considerable discussion as to the advisability of an architect's signing his buildings in precisely the same manner, not at all as a matter of advertisement, but purely as a matter of responsible identification, of properly locating the credit or the blame. While the species of advertising which some of the members of the profession are willing to resort to is anything but self-respecting or desirable, an architect's name should never be dissociated from the work he has produced, and as a matter of justice as well as of news, when the building is mentioned in print the architect's name belongs with it.

BRICKS WITHOUT STRAW.

THE inadequacy of means to desired results is one of the discouraging phases of all the arts and sciences, and no less is the insufficiency in the burnt clay industries apparent to-day than it was in the time of Moses, with the difference that in the light of modern experience, for straw we must read dollars and cents. Or, to drop the simile, there is no difficulty in having good brick and terra-cotta work made. There are plenty of manufacturers to-day who can turn out what is wanted. The lack is not in the brains of the manufacturers nor in the processes of making, but in the amount of money which is available to pay for the product when completed. When an architect or an owner says he is discontented with terra-cotta as a building material, or feels that it is not sufficiently dignified to serve as a medium for his ideas, we will venture the broad statement that in nine cases out of ten the difficulty is rather that he is not willing to pay the price of a thoroughly good article. If our constructors were willing to pay for terra-cotta at the rate they do for stone, the resulting product would be equal to any artistic emergency. It is not fair to the product to put forward as one of its merits that it is cheaper than stone. Certainly most terra-cotta is cheaper than some stone, but burnt clay at its best, fresh from the hand of the artist, with every touch and feeling translated into permanent shape, should be measured for itself entirely irrespective of what it costs, and in planning for specific effects the cost of itself should be the last thing to be considered. Rather, let us try to get first the best effects in the most natural and straightforward manner. Terra-cotta when rightly used is never cheap, either figuratively or literally. The amount of thought and work which can be expended upon the modeling of a single ornament places it entirely above the category of ordinary work. We are appreciating this more and more fully every day in our country; but if one wishes to appreciate that we are trying to get good effects

in terra-cotta without paying the price, and that it is very largely the lack of adequate financial resources which prevents us from elevating terra-cotta to its proper level, one has only to compare the best of our work with buildings like the South Kensington Museum, or the London Natural History Museum. In our American work there is every evidence that our manufacturers know how to make the terra-cotta; but there is also, unfortunately, the evidence that terra-cotta is still suffering from the stigma of being a cheap material, and that in only too many instances our constructors and designers are not willing to give it the same chance that they would without question accord to stone.

WE have received the reprint of a paper upon the subject "Can Buildings be Made Fireproof?" which was presented to the American Society of Civil Engineers by Mr. C. T. Purdy, who is so well known for his excellent work in the lines of architectural engineering that his conclusions have very considerable value. The Pittsburgh fire is the text of the paper, which is very fully illustrated with diagrams and photographs showing the construction of the various buildings involved. Mr. Purdy's opinion is that, limiting the definition of fire-proof building to denote one which will not burn, no matter how great a fire it may be exposed to from without, and which will confine an internal fire to any room in which it occurs without material injury to the rest of the room, the Pittsburgh fire confirms the opinion that buildings can be made fire-proof; but that it is quite essential in making a fire-proof structure which can be depended upon in any emergency, that the best design, the best specification, and the best workmanship in every detail of the construction should be insisted upon. He also concludes that, as now manufactured, porous tile or terra-cotta fire-proofing can be relied upon to protect the steel construction, while the hard-burned material cannot be depended upon with the same certainty. Woodwork covered with wire lathing and plastering is not fire-proof construction, and the efficiency of concrete in flocrs was not tested by this fire.

WITH this number the translation, by Mr. Dillon, of Choisy's "The Art of Building Among the Romans" is completed. Of this work there remains four plates that have not been published. Subscribers who so desire may have these plates sent with the February number of THE BRICKBUILDER by sending notice to that effect to this office.

PERSONAL AND CLUB NEWS.

FRANK F. WARD and Herbert E. Davis have formed a co-partnership under the firm name of Ward & Davis, for the practise of architecture, with offices at 203 Broadway, New York City.

AT the invitation of Mr. Frank Lloyd Wright the members of the Chicago Architectural Club met on the evening of November 29, in a discussion of the "Arts and Crafts."

THE St. Louis Architectural Club held its regular monthly meeting on Saturday night, December 4. President Ittner presided for the first time since the club's vacation. The names of Messrs. E. G. Garden and W. S. Eames were proposed as honorary members. The classes in architecture under R. M. Milligan, and the pen and ink class of Mr. Enders are showing considerable interest in their work. The other classes have not become thoroughly organized yet.

THE regular monthly meeting of the New Jersey Society of Architects was held on Friday, December 3, at Board of Trade rooms, 764 Broad Street, Newark, N. J.

THE chairman of the committee appointed to confer with the Master Mason's Association of the city of Newark, which association requested a conference with a like committee from the society to adjust in general misunderstandings between the architects and builders, reported that the agreement that had been drafted at the last meeting had been finally adopted after minor changes were made.

A REGULAR meeting of the T Square Club was held on Wednesday evening, December 1, the subject for competition being "An Arrangement of Terraces and Steps." Mr. Wilson Eyre was the critic for the evening. First mention was awarded to David K. Boyd, second mention to Wm. C. Hays, and third mention to John Molitor. The award of medal and mentions for the second annual redesigning competition was also announced at this meeting, the drawings having previously been sent to New York, where they were judged by Messrs. John Galen Howard, Bruce Price, and Henry Bacon, who had consented to act as jury for this competition, and made the awards as follows: Gold medal to Horace H. Burrell; second mention to Samuel R. Davis, and third mention to Charles Z. Klauder.

ILLUSTRATED ADVERTISEMENTS.

THE accompanying illustration is of the Brewers Exchange Baltimore, Md., of which Mr. J. E. Sperry, of that city, is the architect. This building is executed in terra-cotta and brick from sidewalk to flag-pole, including a very neat entrance and vestibule, in which the former material is used throughout with highly creditable results.

The terra-cotta was executed by the New York Architectural Terra-Cotta Company.

Another beautiful fireplace mantel designed in brick and terra-cotta is shown in the advertisement of Fiske, Homes & Co., page vii.

In the advertisement of R. Guastavino, page xiv, a group illustration is made which shows the roof over St. Anthony's Chapel, at Washington, D. C., in process of construction. Heins & La Farge are the architects.

Harbison & Walker Company illustrate in their advertisement, page xxv, the Y. M. C. A. Building at Cleveland, Ohio; C. F. Schweinfurth, architect.

Number two of the descriptive series of the roofing tiles made by the Celadon Terra-Cotta Company, Charles T. Harris, Lessee, is given in the company's advertisement, page xxix.

The Philadelphia and Boston Face Brick Company illustrate one of their artistically designed brick mantels in their advertisement, page xxxi.

Examples of bond, showing blocks of the Gilbreth Seam-Face Granite laid up in two styles of bond, is illustrated in the company's advertisement, page xxxviii.

The American Schoolhouse. II.

BY EDMUND M. WHEELWRIGHT.

SLATE blackboards are the most economical in the long run, and, when of proper quality and color, are preferable to any other blackboard. All blackboards should be 4 ft. 6 ins. high. In primary schools they should be set 2 ft. 4 ins. above floor; in grammar and high schools they should be 3 ft. 0 ins. above floor. The chalk receiver should have a receptacle 2¾ ins. wide. It is desirable to have blackboards on all available wall surfaces of schoolrooms and recitation rooms.

Sheathed dadoes should never be used in schoolhouses. They give lodgment for dust, and when removed have often been found to be infested with vermin. The best dado for a schoolhouse is of gauged mortar, with wooden chair rail, where blackboards are not set, and with a plainly molded ogee base run out of 2 in. or 3 in. plank, or better, a like mold of Keene's cement may be used. To facilitate the cleaning of the building, it is advisable that the angles of walls and the junction of walls and ceilings of schoolrooms should be concaved on a radius, as is customary in good hospital construction.

As in a hospital ward, and for the same reasons, as little wood as possible should be used in the finish of a schoolroom. Inaccessible ledges on which dust may collect should be avoided. Jambs of windows and doors may well be finished with round corners in Keene's cement. The floors should be of rift Georgia pine or maple. Schoolhouse floors are not usually finished, although two coats of linseed oil for Georgia pine floors would appear as desirable here as in a private house for the floors that are to be scrubbed. School boards are usually very economical in expenditures for this purpose, a method of saving public funds not conducive to the health of the community. In Germany great pains are taken during construction to thoroughly oil the floors of schoolrooms, and the surface is carefully maintained in use. In Boston ash is found to be the most satisfactory of the inexpensive woods for the interior finish of schoolhouses.

The doors should have transom lights over them, and should have a glass panel set with bottom 4 ft. above floor. Doors should open towards the corridors. There should be a picture molding run around the walls of all schoolrooms, recitation rooms, and assembly halls.

A soft shade of light green is a good color for the walls of schoolrooms of the present standard size with southern exposure,

BROOKLINE HIGH SCHOOL, BROOKLINE, MASS.
Andrews, Jaques & Rantoul, Architects.

while light shades of buff are desirable for rooms with other exposures. No "hot" colors should be used on schoolroom walls. The ceilings should be tinted in light shades of buff. Water color may be used for all plaster above top of blackboard. If the narrower schoolrooms lighted from the left or from the left and right side are ever adopted, it would be possible to paint the walls of the rooms in a lower key than is now advisable where the rooms depend upon the general diffusion of light for their sufficient lighting.

Schoolhouses should have one or more teachers' rooms with toilet room adjoining, and in large schools there should be, in addition, a master's office.

The uses to which a basement may be put depends upon the size of the school. In every school, in addition to the boiler room, coal room, etc., there should be well-lighted play rooms for both sexes, with lavatories adjoining, shut off by fly doors with spring butts. Where sufficient size permits, manual training and cooking class rooms and gymnasiums for both sexes, and where possible, ample bathing facilities may well be provided. Where there is space there should be a well-lighted janitor's closet.

The best flooring for basement, corridors, play rooms, and lavatories is asphalt of the best brands. Where wooden floors are used, they should be laid on screeds bedded in concrete with waterproof paper under upper floor and with no air space. If the site is damp, it is advisable to lay on top of the bottom bed of concrete a thick coating of hot asphalt or tar concrete before setting the floor screeds.

BRIGHTON HIGH SCHOOL, BOSTON.
Edmund M. Wheelwright, City Architect.

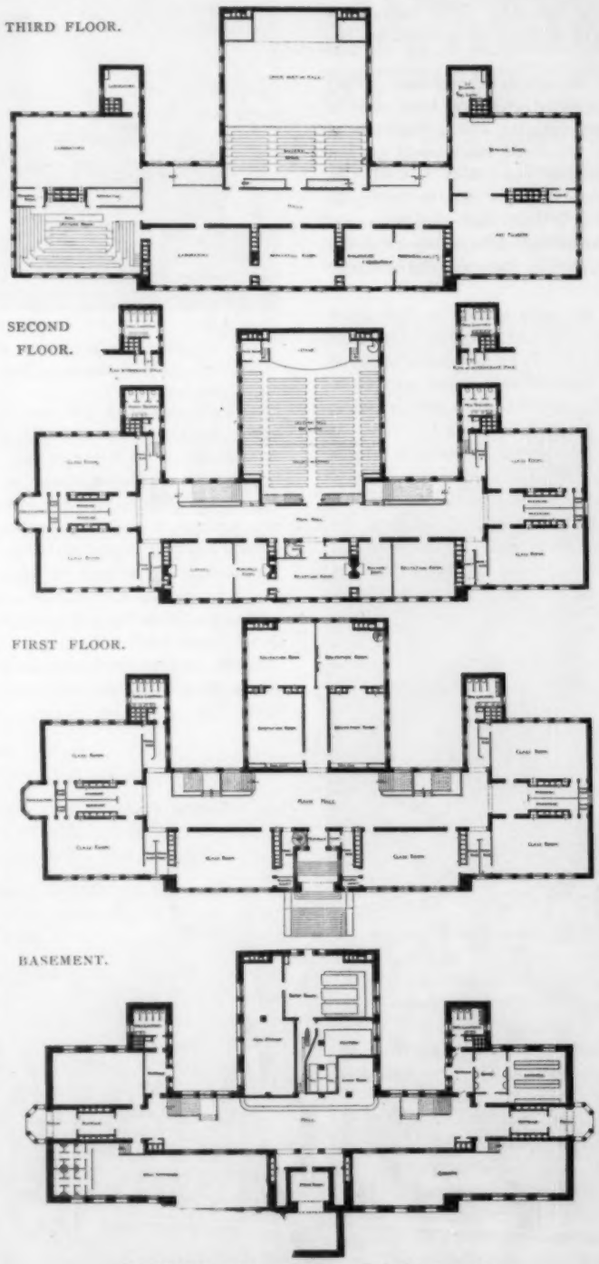
It is a wise precaution to build schoolhouses of four or more stories in height wholly of indestructible materials, that is, they should be of "fire-proof" construction.

It would appear unnecessary under ordinary conditions to use such expensive construction in buildings of three stories or less in height.

The first floor of all schoolhouses should be of "mill" or "fire-proof" construction. With the present low cost of structural steel, a steel and arch construction of the floors is preferable to that of heavy timbers and plank, as the latter construction, though less expensive, is liable to cause considerable annoyance from shrinkage, as practically the market does not afford seasoned stock of large dimensions.

With the first floor constructed of incombustible or slow-burning materials, all interior partitions solid, the plastering laid directly on brick walls, ceilings wire-lathed and the basement staircase protected by fire doors, even if the floors above the first story and the roof are constructed of the ordinary narrow joists with ⅞ in. floor boarding, there is practically no danger from a fire started in the interior of a schoolhouse. If the roof is flat and protected by a battlement wall of ample height, under ordinary surroundings, a fire outside of such a schoolhouse would be a practical danger to the lives of the occupants. In a building constructed as above described, and in the isolated position of most schoolhouses, the scholars would be led to the street before there could be any dangerous condition of the building. There is, however, danger from panic. To avoid this danger by giving the greater sense of security to teachers and pupils, which goes with a solid construction, it would appear advisable to have the floors of fire-proof construction in primary schoolhouses in excess of two stories in height, when in closely built localities.

The inner lining of outer brick walls should be of hard-burned hollow brick, with soft brick set to receive nailings for finish. The interior partitions should either be of brick, terra-cotta lumber, or thin partitions of metal lathing on angle irons. The advantage of such solidity of construction and absence of wood furring is not only to protect from fire, but from vermin.



BROOKLINE HIGH SCHOOL, BROOKLINE, MASS.

In the matter of schoolhouse construction the question of cost is an all-important consideration, and should be at least touched upon in a paper of this kind. An attempt at exhaustive analysis of the subject would be a task disproportionate to the value of the result. General conclusions drawn from data gathered in my own practise, and from that of others, may, however, prove serviceable to architects and school committees. This data should be used with judgment and with careful consideration of the conditions governing each particular case. Estimates based upon cost per square or per cubic foot can never be as safely relied upon as those based upon a survey of quantities, and reckoned according to the prices which maintain at a given time in each locality; but none the less a fairly close approximation of the probable cost of a building can be made by estimates based upon the cost per square or per cubic foot. The basis of cost per schoolroom is the fairest method of comparing roughly the cost of grammar or primary schoolhouses.

To come to a closer judgment of such comparative costs that per cubic foot has often to be taken into account, while, as their plans present less constant characteristics than do those of the schoolhouses for the lower grades, the cost per cubic appears the fairest basis of comparison of costs of high schools.

The architects of the Brookline High School have allowed me to examine the drawings, specifications, contract prices of that building for purpose of comparison with the cost of the Brighton High School, built for the city of Boston. The two buildings were built at about the same time. Reckoned from the top of basement floor to top of cornice, the Brookline High School contains 1,193,880 cu. ft., and cost, without grading and without laboratory, or other similar fittings, $185,000, *i. e.*, close to 15½ cents per cubic foot. The Brighton High School contains 746,854, and cost upon the same basis in round numbers $122,000, or about 16¼ cents per cubic foot, *i. e.*, the proportionate cost of the Brighton High School was 6.6 per cent. more than that of the Brookline High School.

By actual computation 4½ per cent. of this additional cost is explained by the extra thickness of walls and strength of floors required by the Boston Building Laws. As the Brookline school was an admirably constructed building, it will be seen that if the building laws of Boston had permitted, the Brighton school

might have cost between $5,000 and $6,000 less than it did. The Brighton school had slate blackboards, Keene's cement door and window finish, double run of sash above basement, asphalt floor, or equivalent, throughout basement.

The Brookline school had composition blackboards, oak door and window finish, single run of sash throughout, basement floors of concrete or Georgia pine on concrete.

If the Brighton school had been finished as was the Brookline school, the following savings could have been made in the former building: —

Composition in place of slate blackboards	$537.50
Oak instead of Keene's cement finish	226.80
Single in place of double run sash	1,090.00
Concrete and Georgia pine basement floors in place of asphalt	654.00
	$2,508.30

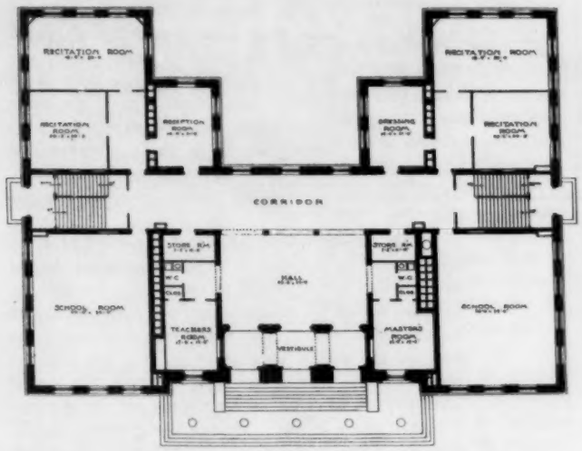
This amount is a trifle more than 2 per cent. of the cost of the Brighton school. The features noted above were originally contemplated by the architects of the Brookline school; they were omitted to bring the cost of the building within its strictly limited appropriation.

The Brookline and Brighton schools had in common certain features not found in less well-constructed buildings, which cost, in the Brighton school, as follows: —

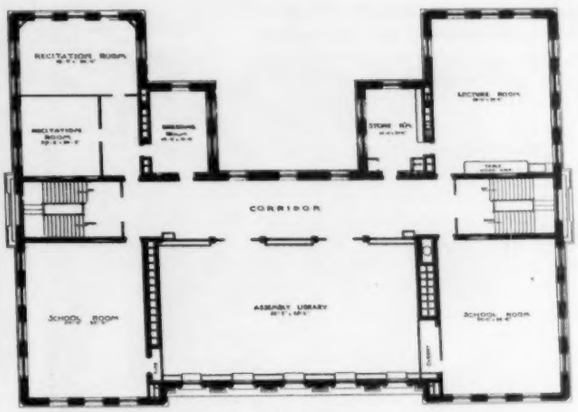
Wire lathed ceilings	$1,328.00
Terra-cotta lumber partitions	606.00
Hospital base	252.00
	$2,186.00

This is 1.8 per cent. of cost of the building.

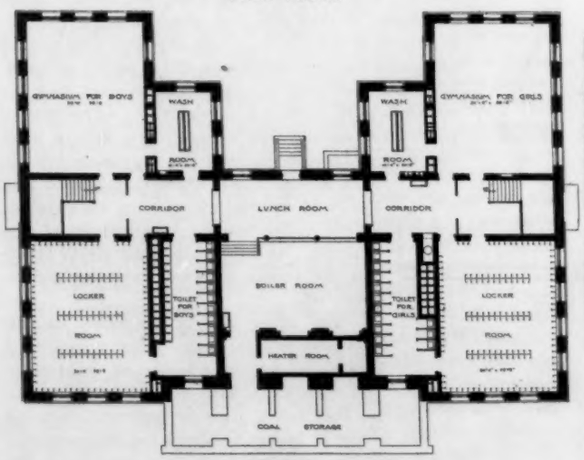
A careful computation of the cost of the Brighton High School shows that if the building had been built as a purely utilitarian structure of the factory type, a saving of 8 per cent. of the cost, or between nine and ten thousand dollars could have been made.



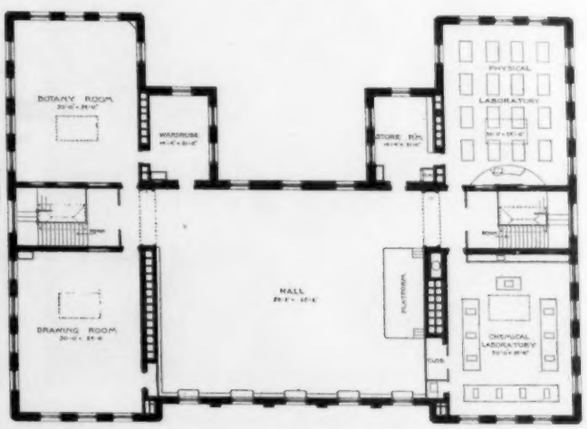
FIRST FLOOR.



SECOND FLOOR.



BASEMENT.



THIRD FLOOR.

The architects of the Brookline school reckon the cost of tower above cornice line as being between $8,000 and $10,000, or about 5 per cent. of cost of the building. There are other architectural features in the Brookline school which increase its cost above that of a purely utilitarian structure. It is probable that a closer analysis of the cost of the two buildings would be about the same proportionate expense for architectural effect.

We may, therefore, safely set the cost of a first-class high school building at 15½ cents per cubic foot. This should apparently be the normal cost of such a building provided with domestic engineering systems of requisite excellence, if built in a locality where the requirements of the building laws involve no needless expense, and where the cost of labor and materials is as high as it is in the neighborhood of Boston.

Important Problems in Construction.

BY WILLIAM W. CREHORE, ASSOC. M. AM. SOC. C. E.

PROBABLY the greatest inconsistencies are found in the details of wooden construction. Girders and beams of ample carrying capacity often have insufficient bearing or rest on improper material. Framed joints between headers and trimmers are weakening at best, and are seldom made to develop the full strength of either member. Frequently these joints are so made as almost to incapacitate one of the members entirely. It is safe to say that architects, as a rule, pay little attention to the design of joints and connections in their wooden construction, but leave this important work to the boss carpenter, trusting largely to his experience. The scarcity of accidents in this kind of construction shows that the carpenter's experience is a valuable guide, but the inconsistencies remain, and much material is absolutely wasted, because it is used where its full strength cannot be developed. The use of iron stirrups in wood framing is becoming more general and ought to be encouraged; it does away with mortising, and thus not only preserves the full value of the timbers intact, but also saves time and labor in erection. The additional first cost is slight.

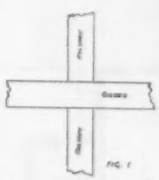


FIG. 1.

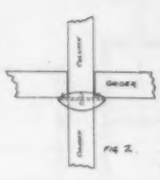


FIG. 2.

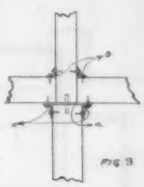


FIG. 3.

FIG. 4.

It has long been customary in wooden construction to rest the posts directly on the girders which pass over the tops of the posts in the story below, as in Fig. 1. By this construction the direct column load crushes the girders across the grain where the timber has only about one fifth the resistance that it has against crushing longitudinally. Consequently, when the posts are figured to their full capacity only one fifth of it can be developed in any arrangement such as this. As a chain is no stronger than its weakest link, so it must be remembered the capacity of a structural system is determined by the weakest spot in the system. There are several devices in use for making these wooden post and girder connections; for example, see Fig. 2, where the post above rests on a kind of cast cap between it and the post below, the sides of this casting being extended to receive the girders. These connections are very loose and do not bind the adjacent members together in any way, their avowed purpose being to "let go" easily in case of fire or accident.

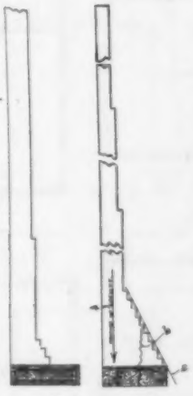


FIG. 6.

FIG. 5.

The connection shown in Fig. 3, however, possesses superior advantages to the cast cap. A steel plate, *a*, is placed between the columns and may be extended in two or more directions to receive girders. A pair of angle knees, *b*, is placed under the girders and made fast to the lower column by lagscrews. Lagscrews also pass up through the angles and the plate into the girders, thus securing the whole system from shifting in either direction. The upper column is held laterally by the ends of the girders in one direction, and to prevent motion the other way a wooden peg is let into the lower column and passes up through a hole in the plate into the upper column; to increase the rigidity of this connection a pair of angles may be used at *c* also, with lagscrews into the column and girders. By properly proportioning the size of the steel plate and angles, this simple connection can be made to fit any combination of wooden girders and posts imaginable. The writer has used it with 12 by 12 girders connecting to 8 by 8 posts with no difficulty whatever. Then, too, each girder and post has a square cut end, and no side straps are required to hold the girders in place. Heavy wooden construction might be safely used with this style of connection, if properly proportioned, in many cases where cast-iron columns are now used with wooden girders.

FIG. 7.

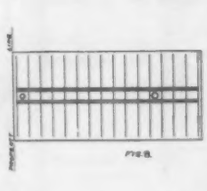


FIG. 8.

FIG. 9.

FIG. 10.

In determining the extent of bearing to give to wall or column footings on different kinds of soil, careful attention should be paid to the old rule about keeping the center of gravity over the middle third, and on soil of a yielding nature still greater accuracy than this is required. If a rigid slab of any kind be laid on a plastic or yielding surface, and a pressure be exerted at some point outside the middle third, the slab will be observed to take a permanent set in an inclined position, lower at the loaded end than at the other, as illustrated in Fig. 4. Similarly, then, but on a larger scale, when a wall is so built and stepped off that the center of gravity of its section falls outside the middle third of its footing course (see Fig. 5) the same phenomenon must be expected, if the footing course is rigid; otherwise the footing course must crack off on or near the line, *b*, which separates the working portion from the idle portion.

This emphasizes the point that a portion of every such footing is idle, and of no effect, or rather, that its effect is bad in proportion to its rigidity, because its tendency is then to assume an inclined position, like the experiment in Fig. 4, and thus cause cracking in the back of the wall at some point about *a* (see Fig. 5); whereas if the footing course could crack, the loaded portion would move on down vertically and the idle portion stay where it was. Besides this "middle third" principle, there is the "sixty-degree" principle, which requires that a straight line, *c*, inclined so as to touch the corner of each step shall make an angle with the horizontal of not less than sixty degrees. This limit of inclination has been established from theoretical considerations as well as by experience, and its observance is a prerequisite to stability in construction. "Problems in construction are all simple enough if you keep in mind two things,—bracing at forty-five degrees, and brickwork at sixty," was a remark made not long ago by an architect who is better known for his artistic ability than for his knowledge of construction. As emphasizing fundamental principles the remark is worth recording and remembering.

The writer may be pardoned for this digression into the realm of first principles, in view of the surprising number of violations of these principles which have been observed to exist in actual work and in plans for proposed new work. The advent of higher buildings and the novelty of all problems connected with their construction, has led some designers to try experiments with first principles to a remarkable extent. To illustrate from an actual case, take Fig. 6. The designer found the side wall loads would require wider footings than he could obtain by stepping up in the usual manner on one side of the wall only, and being reminded of the universal efficacy of steel beams for an emergency decided to imbed a series of them in the concrete under his footings (as shown to scale in Fig. 6), and thus distribute the wall load over the required amount of ground without destroying his interior with stepped-up footings. In effect he simply had a perfectly rigid footing, part of it loaded (rather overloaded) and part of it idle, so that in case of settlement the condition in Fig. 4 will prevail, eventually producing a horizontal crack in the back of the wall.

A large part of the difficulty experienced by designers is due to the necessity for providing for isolated heavy loads at or near the

property line. If it is not possible to arrange the footing so that the load's center of gravity will fall within the middle third of the ground area covered, then it may be tied to another in one rigid bed of steel beams encased in concrete, spreading over enough ground to carry both the loads, and occasionally one bed is made to receive three or four or more loads. In designing one of these grillage beds it is important (1) to shape it so that the center of gravity of all the superimposed loads shall coincide nearly with the center of pressure of the ground area covered, and (2) so to design the grillage itself that it will distribute the imposed loads equitably over every square foot of the ground area. To bring about these results is not as simple a problem as it might at first appear, especially if there are more than two loads, and if their relative positions and magnitudes are irregular.

In the case of two loads on one grillage bed, if the interior load is lighter than that on the property line, the bed should be trapezoidal in shape (see Fig. 7), but if the interior load is heavier, the bed may be rectangular (as in Fig. 8). These requirements arise from the necessity of keeping the center of gravity of the loads coincident with the center of pressure of the area covered by the grillage bed.

The simple square grillage bed (see Fig. 10) for a single interior heavy or moderately heavy load possesses advantages over the stepped-up masonry footing (see Fig. 9) covering the same ground area in that there is much space saved about the column near its base which is lost in the stepped-up footing, or else the latter has to be lower in the ground. At the present prices of steel beams the slight difference in cost is offset by the saving in brickwork and by this gain in space or saving in excavation.

In order to distribute an isolated load or loads over the grillage bed an upper course of steel beams or girders is usually necessary. In the lower course or grillage course proper the beams are laid not more than 12 or 15 ins. center to center, and the concrete between them is depended on to complete the distribution on the ground. In the upper course the problem is to receive the loads from the columns and to distribute them as economically as possible over the lower grillage beams. For this purpose deep beams, or plate girders if more economical, are placed close together directly under the load or loads and extended across all the beams of the lower course. The total bending moment having been figured, it will be found much more economical to make it up by using a few deep beams concentrated under the load than to use many shallow beams spread out over the lower grillage, even though the projecting portion (and therefore the moment) of the lower beams is thereby made somewhat less. In the lower course it would also be more economical to use the deeper beams if they could be spaced further apart, but the close spacing is necessary here to make the distribution of the loads complete.

In the writer's opinion this whole subject of load distribution should receive more attention from designers than is now customary. It is not a feature of high building construction only, but should also be thought of in designing footings for lighter loads as ordinary dwellings. These footings are too often specified arbitrarily without any calculation, and made like some other case where the conditions are supposed to be similar. There are very few kinds of soil that will not bear *some* weight without yielding; it is merely necessary to find out how much or how little the soil will bear on each superficial foot and then to design accordingly with a fair factor of safety. In building a frame house on more or less spongy ground stability will be gained by spreading the footings over an increased area sooner than by sinking them deep, unless solid ground is to be found near at hand. The architect or builder of your suburban residence tells you that it will take a year or two for your house to settle, and that you must expect ceilings and walls to crack, windows to bind, and door jambs to be distorted from rectangles to parallelograms, necessitating frequent visits of the carpenter and the locksmith. This, on the contrary, is not necessary, and a very slight extra expense in the footings to begin with would prevent all the above and similar annoyances which were not directly due to the use of green lumber in constructing the building.

Architectural Terra-Cotta.

BY THOMAS CUSACK.

(*Continued.*)

THE recently erected Bank of Commerce, Cedar and Nassau Streets, New York, of which Mr. James B. Baker is the architect, has been appropriately named; for it certainly is a commercial building *par excellence*. This is indicated, not only by its location and the avocation of its occupants; the design itself would seem to have been suggested by a full and frank acceptance of these underlying facts, as the fundamental conditions on which the embodiment of that idea should be based. So, too, with the detail, which has been worked out on really sensible business principles, enlivened

FIG. 45. BANK OF COMMERCE BUILDING, NEW YORK CITY.
J. B. Baker, Architect.

on the one hand, and held in due subjection on the other by good architectural maxims. It is legible, and on the whole, effective, when viewed from any point of accessibility in a neighborhood where tall buildings now "do congregate." There is a commendable absence of unnecessary fripperies, as also of finical bedizenment, and there is reason to doubt whether the designer cares two cents for triglyphs. Judging not merely by what has been done, but quite as much by what has been wisely left *undone*, in the way of detailing here, we think that common sense has prevailed over pedantry, for which we are disposed to feel thankful. The legibility, and much of the effectiveness just referred to, is accomplished chiefly by a systematic gradation in the size of the various members. They increase in size, just as the ornament increases in boldness of relief, in proportion to its approximate distance from the spectator. In that respect, at least,

we have in this building a timely reminder of an oft-forgotten and in some instances, apparently unknown art, which should not be allowed to pass unimproved.

It is matter for regret that as much cannot be said in behalf of the color scheme, more especially so in regard to the combination

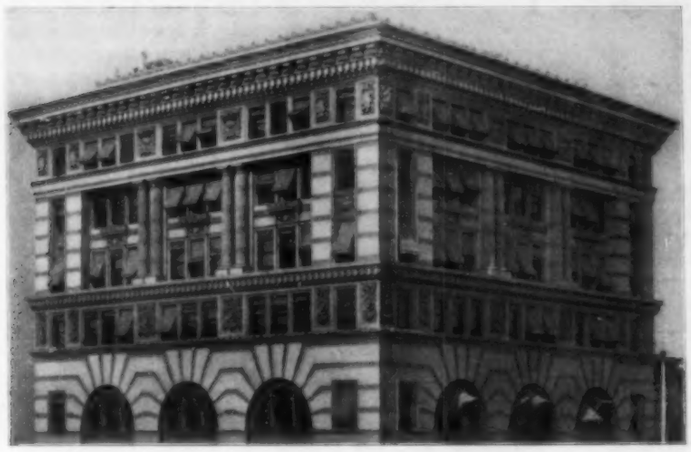


FIG. 46.

of color as between terra-cotta and brick walling. The three lower stories are granite of a bluish cast, for which the terra-cotta through out is a remarkably good match. This is so, not only in color, but in the quality of surface texture, which it is more difficult — and, beyond a certain point, obviously impossible — to produce. The constituents of that unstratified rock, quartz, feldspar, and mica, though in itself of volcanic origin, cannot be reconstructed by fire without the admixture of other and more fusible ingredients. In combination with silica and alumina, etc, they may be rendered more time resisting than the original rock, but they no longer retain their crystalline formation.

The word match is used here out of deference to those who prefer to regard it as such; but *imitation* is the more correct word, and it, like Banquo's ghost, will dog our steps at all hours, whatever we may do to down or disguise it. The more general question of imitating stone will not be shirked when the time comes to discuss it, but in passing let this much suffice for the present. It is done by manufacturers in response to a demand that is well-nigh irresistible, because usually urgent, sometimes peremptory, and not infrequently a condition precedent to the closing of a contract. When that demand ceases or abates in its insistence, so will the supply, but not, we fear, until then. The root of this abnormal growth was exposed not many days ago by a prominent architect, who, in reply to a mild remonstrance on the point by the present writer, remarked in a tone of unavailing regret, "Your argument is all right in theory, but the tide is against you; I have found it so in my own practise." The remark, no less than the confession, showed that he, too, though an architect, was content to remain a creature of circumstance. Nevertheless, in the present instance, as in others just like it, we cannot help thinking that a solid body color in a gray burning clay, adjusted to about the required shade by an admixture of a small percentage of manganese, would have been preferable to the one selected. It would, at all events, have avoided the appearance, and left never a foothold for the charge, of artificiality.

The brick used from the fourth to the fourteenth story (inclusive) are a light buff with a yellowish tinge. This, with the horizontal bands of dark terra-cotta, destroys the idea of vertical homogeneity which is (or, we think, ought to be) the dominant characteristic of a high building. The contrast is also more pronounced than agreeable. There is such a thing as a harmony of contrast, and though that was the thing evidently aimed at here, we leave it for higher authorities on color to say whether the mark has not been missed by several points. Instead of harmony, it appears to approach the margin of that neutral territory, beyond which discord begins.

In Fig. 45 we have a view of such portions of the Bank of Commerce as rise above the Equitable Life Building on the left, and the Mutual Life on the right, with a rear view of Mr. Post's twenty-five-story bantling in the distance. The lower stories disappear from view in the depths of the Nassau Street Canyon, where our lens, by reason of physical limitations, was unable to penetrate. We know for a fact, however, that they rest on a secure foundation of steel, buried in a monolith of cement the size of the entire site, and many feet in thickness. With this assurance, we can now give undivided attention to the four upper stories, on which may be noticed an excellent example of engaged columns of the banded variety, a style that is invariably successful in terra-cotta. Losing sight of all that is below, these four stories and the main cornice, Fig. 46, undergo a favorable transformation, and that because their continuity is not so much broken up by the intrusion of harshly contrasting brickwork. The bluish-gray monotone, however, remains; and whether viewed from the harbor or from adjacent housetops, we

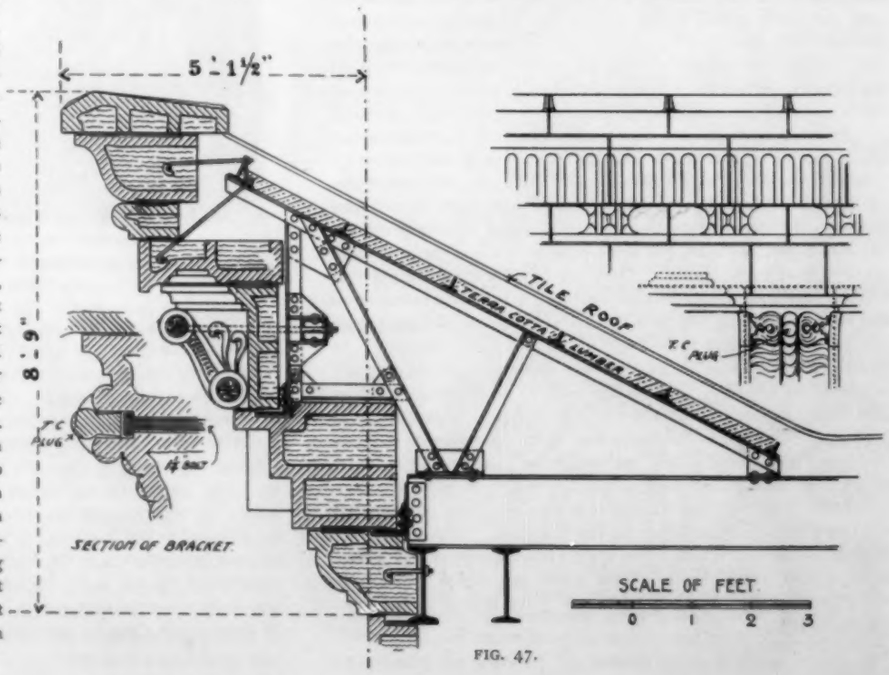


FIG. 47.

think it must be admitted that the color is more than one shade too dark. A lighter color would have yielded a greater proportion of high lights, between which and the deepest shadows there would have been a blending of half-tones to unite the two extremes and preserve an even balance. The absence of this scintillant transition is not felt so much in a strong light when tinted by "that silent architect, the sun"; but under a leaden sky, or when the shades of evening begin to fall, the general effect leans too much to the side of monotony and gloom.

The main cornice, Fig. 47, has a height of 8 ft. 9 ins., and a total projection of 5 ft. 1 in. from wall line; and, as little of its weight rested directly on the wall, it had to be transmitted to the structural framing and to the roof beams. This is done by a series of steel trusses, framed out of 3 by 3 L sections and spaced on about 5 ft. centers. The direct weight of the first course has a partial bearing of about 10 ins. on the wall below, and besides fitting into the flanges of the 15 in. I beam, it likewise rests on the projecting bottom cover-plate. It is also anchored back by a ¾ in. bolt, one end of which takes hold of a ¾ in. rod that passes through the block, the other having a tension nut, by means of which the desired alignment is made, thus overcoming any trifling variation that might occur in the ironwork.

The dental course rests, in part, on a continuous 6 by 6 L section attached to floor beams. On the top bed of these blocks a recess is molded, into which another continuous 6 by 6 channel is bedded, and then riveted to the triangular bracket forming part of the main truss. It will be seen from this that the whole course is held in position in a simple, practicable way, and beyond the possibility of escape. Into the seat thus prepared the modillions are set on about 2 ft. 8 in. centers, and they, in turn, are secured by a 1¼ in. bolt, which, passing through the block, is fastened to the two channels in the manner shown in section. The flat head of this bolt is countersunk, the hole being then filled by a terra-cotta plug, set in cement, the outer end of which becomes one of the balls called for in design of modillion baluster.

The modillions being thus secured beyond peradventure, and the panels between them locked in position, they are made to act as corbels, with sufficient strength to carry the four courses above, and yet leave a wide margin of safety. In these last courses, as with the first one already described, a hole is provided for a ¾ rod to pass clear through the block, from which it may be anchored at convenient intervals, without reference to positions of joints. The coping is set on a liberal bed of cement, which, passing up between the partitions of the cellular bottom bed, grips it in such way as to make anchors unnecessary. The sloping roof is formed of fire-proofing, on which is laid a waterproof covering, to be again protected by a tile pavement laid in cement. The risks of fire and water reduced to a minimum, the damage from incessant friction is rendered practically non-existent.

The construction and execution of this cornice has been spoken highly of by men well qualified to judge of its merits. From their conclusions we see no reason to dissent in any particular. It is a good example of its kind, with a projection in due proportion to its height, and quite sufficient as the crowning member of a twenty-story building. Most important of all, we think it is safe, which is more than can be said in the case of all the terra cotta cornices of recent erection, with which we are acquainted. There may be things in this world about which "ignorance is bliss," but the security of overhanging members, suspended at heights varying from one to three hundred feet, in a city's most crowded thoroughfares, finds no place in that category. Some day, we fear, there may be a tale to tell on this subject, in regard to which those who had furnished the sensational features would be cited as involuntary listeners. The meritorious examples that have been selected for discussion may, in some measure, help to encourage and promote the construction of others equally good. In this, the one thing required is an intelligent application of the same (or similar) principles, honestly applied and modified to meet the exigencies of the subject in hand.

The Art of Building among the Romans.

Translated from the French of AUGUSTE CHOISY by Arthur J. Dillon.

PART III.

CHAPTER II.

THE ART OF BUILDING AND THE ORGANIZATION OF THE WORKING CLASSES.—(*Concluded*).

THE number of monuments built by the Roman troops was considerable. It was one of the Roman principles that the soldiers should never, under any circumstances, remain idle; and, as must be confessed, it was principally to avoid dangerous inactivity that they were employed on the buildings, and frequently they were thus employed, the Roman writers tell us, on buildings which were otherwise superfluous. When Vitellius had the amphitheaters of Bologna and Cremona built by the soldiers, he thought less of bestowing on the cities these useful buildings than of controlling for the moment the turbulent spirit of the legionaries. In Africa we again find the Roman soldiers building amphitheaters; in Brittany, fortifications; in Egypt, tombs, bridges, temples, porticos, basilicas; in Italy, the great roads, and everywhere the mention of their work is accompanied by the curious observation that "the monuments were undertaken in order to occupy their leisure."

It was not only the soldiers that were thus transformed into workmen, for such was the simplicity of the Roman methods that even the prisoners that the Romans held and the convicts from the lowest ranks of the people could be used for the same purpose. Condemnation to labor on the public works was a recognized legal penalty. It is cited by Paulus, and may be read on every page of the Theodosian legislation.

The work was principally in extracting the material for buildings, and it was from among the prisoners, principally the Christian prisoners, that the workmen were recruited who quarried the stone and dug sand for the Baths of Diocletian; and long before, all the prisoners of the empire had, under different pretenses, been put to work on the canal of Avernus, as well as on that colossal assemblage of palaces called the House of Gold. "To complete them," says Suetonius, "all who were in the State prisons were brought to Rome by the order of the emperor, and he did not allow those convicted of crimes to be sentenced to any punishment except labor on the public works."[1]

The Romans even went still farther. Not satisfied in placing prisoners and soldiers side by side with the workmen, they even called to the work of construction free citizens and men most unused to work, demanding of the one, materials, of the others the aid of their arms. This unusual but systematic imposition was particularly developed toward the seventh century along with the rise of despotism, and it was continued under varying names until long after the fall of the empire. But in order to see things from the proper point of view it is necessary to go farther back.

The Roman idea of taxation was entirely different from that held to-day. People were then divided into two distinct parts; one was the urban population, who as a whole had the benefit of the rights of the cities and of the municipal franchises; it was composed of descendants of the ancient Roman colonists, men of the race of conquerors, as could be seen by their liberties and privileges. Beneath this class was the taxable population, the remains of the indigenous race, which was constrained to provide for the other half

[1] The texts establishing this participation in public works by prisoners are these:—
Paul., Sentent., Lib. V., tit. de Poenis; Cod. Theod., Lib. XIV., tit. X., l. 4; Digest., Lib XLVIII., tit. XIV., l. 34, l. 8, § 7, etc.
On the construction of the Baths of Diocletian with the aid of convicts: Annales eccles. Baronii, ann. 298, act. Sta. Marcelli.
Construction of the House of Gold and of the canal of Avernus: Suet., Nero, Cap. XXXI.

of the empire by its labor. The imposts they paid were not only taxes to cover the cost of the government; they were also, in fact above all, tribute paid to the luxury and subsistance of the great cities. This fact alone establishes the great difference between the social economy of antiquity and that of to-day. The difference is, however, not only in the destination of the results of taxation, for it is even more apparent when the elements which made up the public revenue and the manner of its collection are examined.

This tribute, which was imposed on the vanquished, should have been redeemable, as with us, in money, which could then be exchanged for the necessities of the conquerors; but the interposition of money seemed a useless complication to the Romans, and instead of obtaining the products of the soil and of labor by the use of money exacted from their tributaries, they preferred to suppress all such intermediaries and collect the debts of the provinces in such shape that they could be immediately utilized; so a large part of the taxation was collected not in money, but in kind, and those who were responsible for the provisioning of Rome were, in most cases, the collectors of these curious taxes.[1]

Building materials were among the taxes in kind which the Romans thus collected. For example, the curiales of Etruria paid annually to Rome 900 cartloads of lime; the city of Terracina had a similar impost to pay, and the product of these taxes was reserved exclusively for public works, lighthouses, wharves, etc. Such and such a country sent the Romans building stone, another a tribute of bricks. These materials were a percentage of the products of various industries, just as in certain provinces (among others Bruttium and Calabria) a part of their flocks and herds, and from Egypt and Sicily a portion of their wheat was taken. Distinct regulations, moreover, prohibited the acceptance of an equivalent in money, and thus guaranteed to the public works supplies of material whose amount was limited only by the moderation of the Romans.[2]

It was in this manner that the owners of the soil assisted, by contributions of taxes in kind, in the establishment of public edifices. As for the lower classes, whose almost total lack of property sheltered them from taxes either in kind or in money, they owed to the public works a tribute of another sort, forced labor.

The corvée played an important rôle in the public works of the last centuries. The Romans disdainfully called this form of tax "sordida munera," and counted among the services that could be demanded of that part of the population subject to forced labor, the proportion of the lime for public works and personal concurrence in "the construction of the public monuments, the sacred buildings, and the great roads of the empire." The people[3] who took part in these works were in principle all the inhabitants of the empire, except the officers of the government, and the dignitaries of the church, and the army. Nevertheless, the exceptions should have been greater in practise; and judging from appearances, it is probable that the Roman authority excepted all the population of the great cities from whom they provided provisions and pleasures, and from whom, it would seem, they were far from exacting onerous assistance or useful services.

It remains to say how these taxes were imposed, what recourse there was against their exaction, and what laws determined their extent and tempered their rigors. But, with a remarkable gap, the Code leaves these serious questions in the most absolute vagueness. More than twenty[4] constitutions relate to the "sordida munera," and among so many laws there is not one which defines the rights and obligations of the subjects of the empire, who came within the scope of these onerous regulations; all treat of the exceptions, the only thing which they neglect to define is the extent of the obligations which they impose. Thus is seen, even in the silence of the law, the spirit of a system which was based entirely on exceptions and privileges. This gap in the laws left open an unlimited field for arbitrary and oppressive measures, and the frequencies of the corvées under the rule of the emperors shows the strangest forgetfulness of equity in the distribution of the public burdens. Taxes in the form of personal labor have, among other wrongs, that of being imposed exclusively on those taxpayers who, by chance, happen to be in the vicinity. But the Roman emperors hesitated but little over principles when it was a question of a tax that fell on a class of the people who had been reduced, by centuries of servitude, to passive instruments. These general levies were a sure and swift means of attaining their object, and this advantage was sufficient for them. They had frequent recourse to it during the despotic times that preceded the dismemberment of the Roman world. It was by this means that Diocletian was able to execute, in so few years, the embellishment of Nicomedia, of which he wished to make a second capital of the empire, and a rival of ancient Rome. Basilicas, palaces, a circus, a mint, an arsenal, were raised in the new city by the unaided arms of the inhabitants of the city. They were compelled to transport the materials at their own expense, to furnish all the necessary engines and machinery, and even to cede to the emperor the sites of their own houses. These requisitions, of which Lactantius has left us so striking a picture,[6] were so unexceptional in the eyes of the Romans that one of their historians eulogizes Vespasian for having constructed buildings in the provinces "without having taken laborers from the fields."[7] The whole spirit of antiquity is shown by this single remark, which becomes even more characteristic when it is considered that it relates to one of the most prosperous periods of Rome and to one of the best princes that ever ruled the empire.

To sum up: Rome took its unskilled labor from the population subject to the corvée, and its skilled workmen from the local corporations; the corvée and the corporations were the two elements which supplied the labor for the construction of those monuments whose ruins we admire; to unite them was to unite material power and the strength of tradition and to furnish the empire with resources sufficient for the most colossal undertakings. But as they owed their existence to a false organization of society, these resources were rapidly dissipated, and the empire finally experienced the fatal results of an economic system founded on disregard of individual right and private liberty; the country supported during three centuries the painful laws which compelled it to construct for the cities buildings of a purely municipal character; the small towns themselves were put

[1] The details preserved in the Theodosian Code, Lib. XIV., tit. IV., on the organization of the "Suarii" should be examined in this connection. I chose this example because these tax collectors, who were also counted among the principal contractors, are perhaps those whose functions were most clearly defined; and from this point of view, a study of their organization should precede any general research on the method of collecting the taxes in kind among the ancients.

[2] Tributes of lime paid by Etruria and Terracina: Cod. Theod., Lib. XIV., tit. VI., l. 3; Symmach., lib. X., cap. 53.

Tributes paid in building stone: Cod. Theod., lib. XIV., tit. VI., l. 4.

Tributes paid in brick. See the notice published by Nardini at the end of his "Roma Antica," designated "Lettera d'Ott. Falconieri sopra l'iscrizione d'un mattone," etc.

Rule against the acceptance of money in place of tributes in kind: Cod. Theod., Lib. XV., tit. I., l. 17.

No part of these materials was conceded to individuals unless the portions paid by the tributaries exceeded the limit of the public needs: Cod. Theod., Lib. XIV., tit. VI., l. 4.

[3] Cod. Theod., Lib. XI., tit. XVI., l. 15. 18. The list of the taxes varies greatly. To show this it is sufficient to compare the enumeration of the fifth century in the Theodosian Code with that in the Justinian Code of the sixth century (Lib. X., Cap. XLVII., l. 12). There is a direct proof of these variations; for example, that the care of the great roads ceased to be placed among the "sordida munera" under Theodosius the younger. But these fluctuations of the Roman law are of little importance, for we are more concerned with the general idea than with the details of its application.

[4] Cod. Theod., Lib. XI., tit. XVI., l. 15, etc.

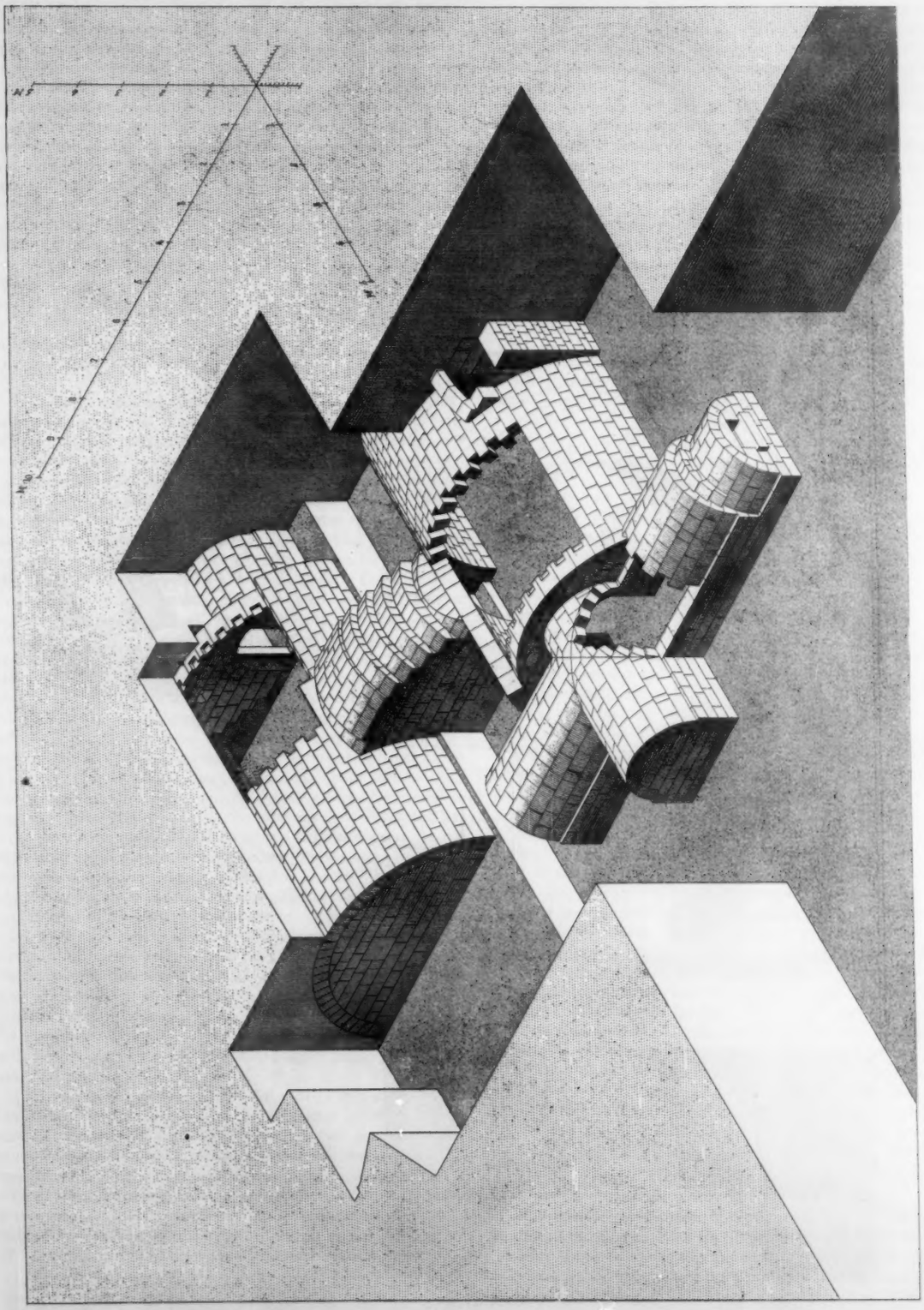
[5] It is necessary to make a careful distinction between the "sordida munera" and the "extraordinaria munera." The two kinds of contributions, although the juridical texts frequently connect them, were, by their nature, profoundly distinct. The Theodosian Code never confounds them and sometimes it even opposes them, as can be seen in Lib. XI., tit. XVI., l. 15. "Sane rerum extraordinariarum munus ab omnib. omnino Magnif. tua sciat esse poscendum . . . . Sordidorum vero munerum talis exceptio sit, ut . . ."

The "sordida munerum" were the corvées, the "extraordinaria munera" were simply increases of taxation. It will be remarked that there were much fewer exceptions to the "extraordinaria muneria" than to the "sordida muneria"; but, on the other hand, their imposition was guarded by a host of guarantees, none of which extended to the "sordida munera." See, in support of this observation, the following constitutions where the "sordida munera" appears, and whose character is defined by their assemblage.

Cod. Theod., Lib. VI., tit. XXIII., 3, 4; tit. XXVI., 14; tit. XXXIV., 1, 4; Lib. XI., tit. XVI., 5, 15, 16, 18, 19, 20, 21, 22, 23; Lib. XIII., tit. III., 12; Lib. XIV., tit. IV., 6; Cod. Just., Lib. X., tit. XLVII.

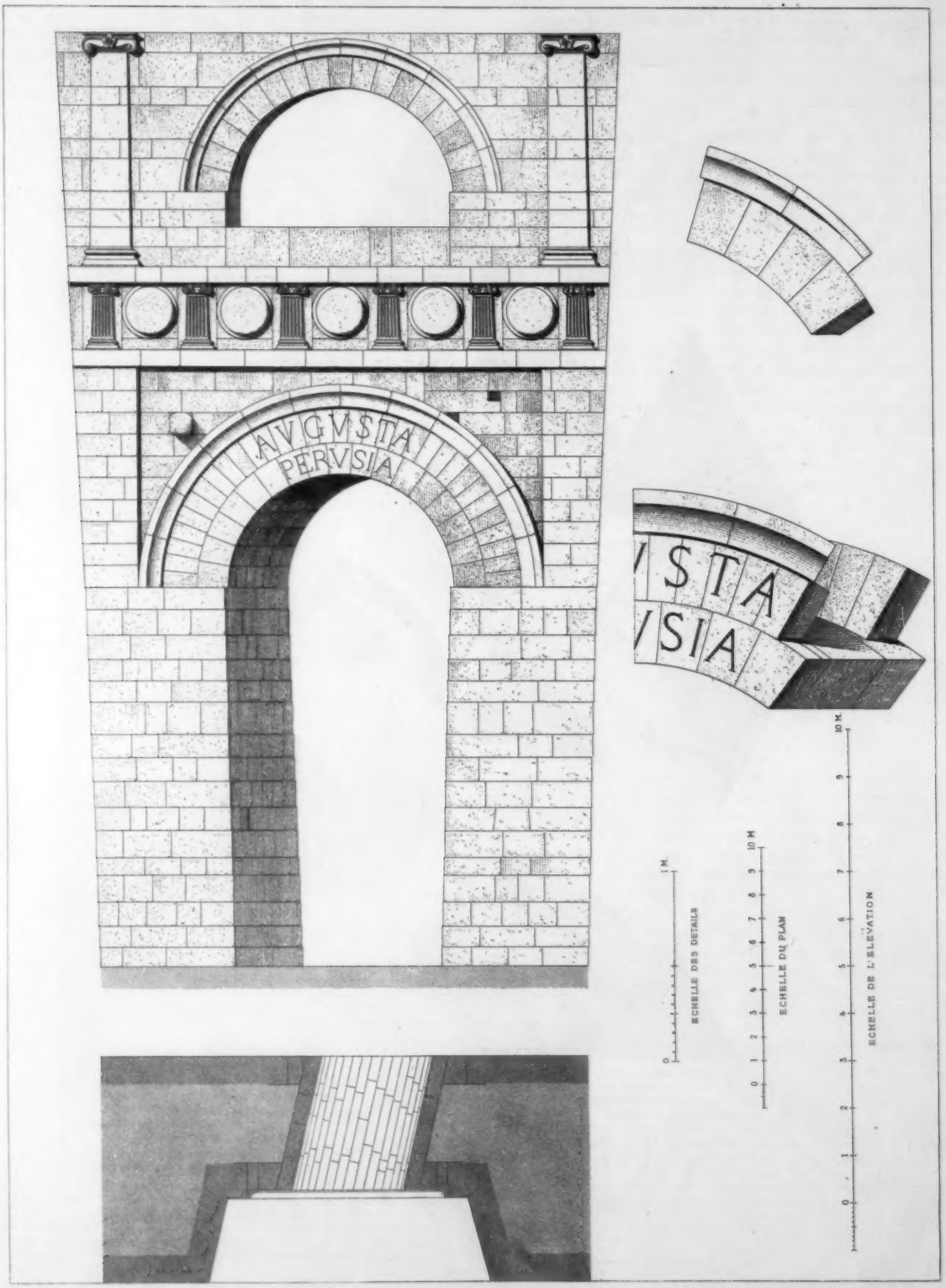
[6] Lact., de Mortib. persec., Cap. VII.

[7] Aurel. Vict., de Cæsarib., Cap. IX. I take this observation from the work of M. Naudet, "des Changements opérés dans toutes les parties de l'Empire romain," etc.



VIVIERES.

PLATE XIX. THE ART OF BUILDING AMONG THE ROMANS.



PEROUSE.

PLATE XX. THE ART OF BUILDING AMONG THE ROMANS.

under the obligation of contributing to the expenses of the great cities.[1] But finally, incapable of meeting the exigencies of the imperial tyranny, the inhabitants of the country, as, for example, in Gaul, profited by the relaxation of the bonds which tied them to the empire to arm themselves against it and ceased to be its auxiliaries in order to become its enemies.

In their turn the corporations had their period of decline; their members, ruined by a system of tariffs and statutes that legally deprived them of part of the payment due for their services, came finally to seek asylum outside of the cities by taking refuge in the colonies, or even going beyond the frontiers; they sought to find a larger and more liberal life among the barbarians. This was the signal for the abandonment of the old methods; they had declined with the increase of public misery, but they fell definitely with the fall of the corporations that were the depositories of their secrets. The first constitutions opposed to the dissolution of the corporations date from the immediate successors of Constantine. They attempted to stop the evil by reviving the traditional methods; but the fall was irremediable, the sequence of the traditions was broken, and architecture existed only in the memory of the past and in the monuments of the Roman greatness.

It is hardly necessary to point out the differences which should distinguish the methods of the architecture of the empire and that which is suitable to modern nations. They lie in the differences of the two civilizations themselves, and they arise from the double picture we have shown of the methods of building, and the institutions that explain them. Knowing how the methods of the art of building of former days satisfied the needs of the Roman civilization, one can easily see the reasons that should prohibit them to-day, or at least modify their form and limit their use; it can be understood that these gigantic constructions, where the simplicity of the methods is compensated by an immense increase of labor, properly belong to the days of slavery and forced labor. The affranchisement of the laboring classes, putting a price on all work, imposes on the builder the necessity of taking the material difficulties more into account, of measuring with greater care the amount of time and effort he must spend. The Roman methods are possible only under a great empire whose resources are concentrated under an absolute government; and this is so certain that the Romans themselves, as soon as they built for private purposes, as soon as they had to pay for labor, either in salaries to the members of the corporations, or in buying the slaves who worked for them, renounced the luxury of solidity. The vestiges of Pompeii, and the ruins of the villas scattered about the Campagna of Rome show this fundamental distinction most clearly; their construction is essentially slight, and they are less like the official works of the contemporary epochs than like the buildings of the Lower Empire, whose construction is recalled by the Christian basilicas. Moreover, the work to be expected from slaves is different than that from free workmen exercising without constraint their chosen trades. Intelligence develops with the amelioration of physical conditions, and we may ask more from logical combinations and less from physical force; in a word, we may leave a greater field for the personal initiative of each artisan. This is one of the first causes of the changes in the art of building, but still other reasons oblige us to give our architecture a new aspect, and apply different methods to our construction.

There are, in fact, two methods of construction appropriate to two clearly distinct conditions of society; either buildings are constructed as a whole of a solidity that protects them from the chances of destruction for centuries, or else, accepting the conditions of maintenance, and the chances of a proximate reconstruction, buildings are erected whose existence must be prolonged from day to day, whose preservation is a constant expense. It is the last method that tends to prevail among modern nations. Given up to the preoccupation of production, they seek to reserve for creative enterprises a part of the resources which the Romans devoted to the monuments of the empire; and when the income of the amount so saved exceeds the cost of maintenance and reconstruction, the difference is regarded as an increase of the public wealth. The Romans would have difficulty in comprehending such a calculation. Accustomed to live by the labor and tribute of conquered nations, they regarded their personal interests as the end and aim of all the energy of the peoples whom conquest had made their slaves, and they found in this resource all that was necessary to give their works a solidity which it would be wrong to seek in modern times. Our buildings will have but a short existence; many of them will scarcely survive us. It is not sure that the needs to which they owe their existence will last after us; and the ruin of these frail edifices is a small matter if the economy in building them as they are built is sufficient to replace them by others more in accord with the new generations.

Unceasing transformation; this, in a word, is the condition of modern architecture. The constant movement of society forces architecture into a series of changes whose result it is useless to predict and whose end is impossible to foresee. But whatever make be its variations, our architecture is bound to the past with unbreakable bonds; its origin carries us back, in spite of ourselves, to ancient Rome, and for a yet long time will it be necessary to seek the principles of its methods and the hidden end to which it is tending.

THE END.

[1] Cod. Theod., Lib. XV., l. 18 et 26: Laws cited by M. Serrigny in his work on "Le Droit publique et Administratif des Romains."

ENAMELED BRICKS FOR THE FRONTS OF BUILDINGS.

AT the time that the American "glazed" bricks failed, English enameled bricks were imported at a much higher price, and were used for facing the interior courts of most of our large office buildings. One of the most recent, however, the Marquette, has been faced in its courts with the new-made American enameled bricks. Thus far these inner courts have afforded the principal places for their use; but in England they are extensively employed on the interior of buildings, in the lining of kitchens, vestibules, and latrines, and for manufacturing buildings and laboratories, in which they effectually resist the action of the acids in the air.

In cities of the interior of this country, where much bituminous coal is consumed, the *bête noire* (almost literally) of the architect is the disfigurement of the exterior of buildings with the condensations from soot. These are of a gummy nature, contain creosote, adhere with obstinacy to every building material, and after a few years they cannot be removed, even with soap. Red bricks were found to turn to a dirty chocolate color, and were not free from disfigurement. The only remedy that house owners could find (and that an expensive one) was to paint stone and brick alike, so that to-day more than half of the best buildings of Chicago and other cities are painted.

The architects of the Rookery saw their opportunity to avoid this in one fine building when the dark semi-glazed "obsidian" brick came on the market. This was a frank acceptance of the situation and a surrender to what was then thought to be the inevitable. They made the exterior the exact color of smoke-dirt, and so it has remained ever since; but we now see the dirt and not the bricks, which are completely covered. The owners have avoided the expense of repeated painting, and have been the gainers thereby. Many other buildings have been similarly faced since then.

But since reliable American enameled bricks have been on the market, architects and owners have been able to face their buildings with bricks that can be kept clean if washed periodically; for even the best enameled bricks will not keep themselves clean, and the hardest rains will not wash off soot condensations. But washing is cheaper than painting. — *Inland Architect.*

THE falling of a piece of cornice, from the eleventh story of the Times Building on Park Row, New York, illustrates the danger of using stone for projecting construction in cities. Sandstone was employed in this case, and the Building Department stated that frost was the active agent in causing the accident.—*Eng. News.*

Fire-proofing Department.

TEST OF FIRE-PROOFING MATERIAL.

WHEN one considers the immense interests involved and the terrible consequences of the failure of any vital portion of a large building, the reasons for frequent and thorough testing of all kinds of building material is readily appreciated. Even with the utmost care unexpected weaknesses may be developed. While such conditions might not be entirely obviated by proper tests, it is quite certain that preliminary investigations would be apt to reveal indications of possible failure, and a wise constructor would give a questionable material the benefit of the doubt by avoiding its use altogether. Tests are quite as desirable for ascertaining what to avoid as for affording a measure of possibilities, and our constructive literature is full of reports of both public and private tests of all sorts of materials. It is, however, with the more recently adopted materials of construction that tests have been most numerous, and especially with fire-proofing in its various forms, a construction which has struggled out of an experimental stage, and from which, as has been admirably shown by Mr. Wight's articles in these columns, very definite, and on the whole extremely satisfactory conclusions have been reached, and there have been in recent years many exhaustive and satisfactory tests made with a view to determining the reliability of the various fire-proofing mediums. Any one who has compared reports of the various tests cannot, however, but be struck with one fact which is very prominent, namely, that the large majority of them have been devoted to an investigation of the material itself, independently of the method of use; thus there have been experiments in Denver, New York, Boston, in fact in nearly every large city, which have shown conclusively that terra-cotta can be depended upon to resist a high degree of heat, and to properly protect a concealed steel construction. The results of most of these investigations are permanently on record, and are readily available to the student or the constructor, and the tests have been so thorough and impartial that it would seem as if, after the years which were taken to develop the fire-proofing industries and the numerous opportunities for showing the resisting powers, we ought to be pretty well down to a basis from which we can start in laying out any species of construction depending for its protection upon the qualities of burnt clay. We believe in tests. They not only keep alive an interest in scientific reasoning, but they serve to keep up the standard of the manufacturer, and yet we have been sometimes led to question whether the more recent tests of fire-proof buildings have not been in the nature of thrashing old wheat, whether the time has not come to stop questioning whether terra-cotta will stand fire or whether something else is better, and to confine our tests to a more practical demonstration of how to do rather than what to do with, admitting at the very start the results of investigations which are too manifestly decisive to admit of a great deal of argument.

Theoretically and practically it has been established that terra-cotta, if properly applied, does protect. The theoretical demonstration has been made in numerous private and semi-public tests of small sections of flooring, column protection, etc. The practical tests have been applied in such conflagrations as the Pittsburgh fire, Western Telegraph Building in New York, the Athletic Club in Chicago. Though opinions may differ as to the economic advisability of using one material or another, or a different form, terra-cotta itself is no longer an experiment, it is a scientific fact, the records of which are open to any one who reads.

But what we do need tests upon is the details of construction. No one is ready yet to admit that the last word has been uttered or the final solution achieved in the application of burnt clay to purposes of fire-proofing. There is a great deal of clumsiness in manipulation which must be obviated. There is weight to be reduced, there are shapes to be improved, and there are systems of application which would bear a great deal of study. Along these lines tests are of value, and a great many of them can be made to follow new and unsolved paths. The material itself, however, with all the variations of the different manufacturers in the different parts of the country, is practically the same throughout. It is not like steel, every melt of which may be different, and which, consequently, requires tests at frequent intervals. The extremes of hard and porous terra-cotta are perfectly understood, and can be scientifically analyzed and applied.

An absolutely fire-proof building is, of course, an impossibility, for no structure has yet been devised which could not be affected to some extent by heat if the combination of conditions were favorable. We cannot fire-proof the contents of any structure by merely enclosing the supports in a fire-resisting envelope. But we can vastly improve not only the details of construction, the methods of applying the brick and terra-cotta, the manner in which the protecting envelope is applied to the beams and the columns, the precise arrangement of supports, ties, etc., but we can also, to advantage, make very decided and radical changes in the arrangement of so-called fire-proof buildings, by which their resisting powers can be greatly increased. Fire-proof construction is not merely a question of floor and column protection, but one of the essential requirements is that the structure shall be so arranged that fire cannot readily spread from one part to another; consequently we need to devote more study than is usually allowed to the arrangement of corridors and partitions, as well as to the window openings and the construction of elevator wells and light shafts. It may be open to argument whether an elevator well is safer from a fire standpoint if it is enclosed in brick walls than if it is entirely open. In the former case it can easily become a huge blast chimney. In the latter case the fire enters it more readily. But certainly the partitions and elevator arrangements are not usually conspicuous for the amount of study which has been expended upon them, and we could well afford to expend some of our test money upon the determination of the best kind of construction to answer for partitions, to resist not only heat, but also the air pressure, which sometimes is quite considerable in a building, as well as the even more disastrous effects of the fireman's hose. One of our correspondents has said quite truly that in one of the notable instances in which a fire-proof building was exposed to the effect of a conflagration from an adjoining structure far more damage was done by the firemen than by the fire; that if the building had been left alone the waves of fire would have beat against it impotently, but the combination of water and fire was too much for it. All of which simply shows that we must consider all possibilities in designing a fire-proof construction.

Then there is opportunity for considerable investigation in devising a fire-proof window. It has been suggested that wire glass could be used in metal frames, and that wire glass when properly set will melt before it will let the heat through. So far as we know, this has never been tried, and we should suppose that, even assuming the glass stood the heat, a few drops of water might change conditions considerably. Window frames and staff beads are almost invariably built of wood. In the fire in the Potter Building, New York, some time ago, if we are correctly informed, fire was communicated from story to story through an interior well by means of the wood finish around the windows. If instead of exposed wood the frames were to be set flush with the jambs or with a projecting terra-cotta molding to cover the frame, and the sashes themselves were of sheet metal on a wood foundation, similar to the construction of tinned wooden shutters, the danger of ignition would be reduced to an insignificant minimum. Here again is another chance for a long series of valuable fire-proofing tests. In fact, the possibilities of improvement in even the best of our fire-proof structures are so manifest, there is so much remaining to be done which can be accomplished only through the direct agency of carefully conducted scientific experiments and tests, that we can well afford to admit the results of previous investigations, and can with great profit continue our investigations along the line of the unknown, having already so much firm ground to tread on.

A COMPETITIVE (?) TEST.

NEW YORK, Dec. 20, 1897.

TO THE EDITOR THE BRICKBUILDER: —

Dear Sir: — The impression seeming to prevail among those not familiar with the details, that we were participants in an attempted joint test of our end-construction, porous hollow-tile arch, and one of the Roebling concrete method, which occurred on November 19, last, at 68th Street and Avenue A, this city, we ask that you kindly grant us the use of your columns for a dispassionate statement regarding it, from its inception to its final merited miscarriage.

We do not dispute the fact that portions of the tile used in the construction of this arch were procured by John A. Roebling's Sons Company in a near-by city, but aside from that we had no voice in the matter of detail or the manner of construction.

Under the administration of Stevenson Constable, Superintendent of Buildings, New York City, and the supervision of his brother, Howard, there have been no less than fourteen tests made of different systems of fire-proofing, all governed by the following conditions: — 5 to 6 hours' firing, followed by water applied under a pressure of 60 lbs. to the square inch. A full report of these various tests was furnished *The Engineering Record* (see Vol. 36, Nos. 16–19) by Stevenson Constable.

Deeming the fire period — 5 to 6 hours — which had governed these fourteen tests inadequate to determine the resistance to intense heat of fire-proofing material, we, in March last, at the request of Mr. Constable, threw down a challenge to all, for a joint test of *24 hours' continuous fire*, of 10 in. porous end-construction flat arches, followed by water applied under a pressure of 60 lbs. to the square inch. On September 7, the John A. Roebling's Sons Company, in a letter addressed to Constable, purport to accept our challenge; but instead of a fire test of 24 hours' continuous duration — the main purpose of our challenge — propose one of 4 hours only, which is to be followed by cooling, then application of water, and so repeated; and further providing: "The Roebling arch to be constructed in the same manner — material, quality, and proportion — as they will guarantee to construct their floor systems *in the future* in the city of New York." "The material for the hollow brick arch to be purchased at some building in course of construction, where such material has been delivered by Henry Maurer & Son, without special selection as to quality, and to be the regular 8 in. hard-burnt clay or porous terra-cotta side or end construction."

These conditions not confirming to those of our challenge, we declined the proposition and considered the whole matter settled; at which conclusion it seems the Roebling Company also arrived.

The John A. Roebling's Sons Company, however, instigated by Mr. Constable, determined to proceed with the test — under conditions imposed by themselves, and presumably the most favorable for their method — and with the material procured at considerable trouble and expense, with additional tile from other manufacturers, they proceed to erect an end-construction arch of 5 ft. span, in a structure adjoining a concrete arch prepared, superintended, and constructed by them.

We quote: "The Roebling arch in the test structure was identical as to proportions, manipulation, etc., with the fire-proof arches erected by the John A. Roebling's Sons Company, and represents the standard construction of that company.

"The hollow-tile arch is a modern pattern, end-construction type, of flat arch erected with care" (sic) "so as to represent as nearly as possible the usual workmanship, as found in fire-proof buildings now in the course of construction in New York City."

It did not require deep penetration to discern the result — sure to follow — when a hollow-tile arch, constructed, as we see, under the fostering (?) care of a rival concrete interest, came to be tested, and that test under the sole control of such interest; the result we had foreseen followed. The end-construction arch, after 3 hours' firing, loaded with but 150 lbs. to the square foot, fell in; but in falling disclosed the secret of its fall: glaring defects of construction!

A study of the results of other tests, both of hollow-tile and the Roebling concrete arch, which we collate below, will convincingly show that the test, of which this letter treats, was simply a farce.

TESTS OF HOLLOW-TILE ARCHES.

DENVER, COL., Dec. 20, 1893.

"An end-construction, porous terra-cotta arch of 5 ft. span, after undergoing a continuous fire test for 24 hours, was practically uninjured, as it afterward supported a weight of bricks of 12,500 lbs. in a space 3 ft. wide in the middle of the arch."

PITTSBURG, PA., May 3, 1897.

"The report of S. Albert Reed to the New York Tariff Association shows that the end construction, porous tile arches were superior to the side-construction, hard-burned tile arches; that all floors of either method were practically uninjured."

But our concrete friends claim that these tests were too far from New York to be conclusive, so we quote Stevenson Constable himself: —

NEW YORK, Sept. 29, 1896.

(See *Engineering Record*, No. 19, pp. 402, 403.)

"An end-construction, porous terra-cotta arch, loaded with 150 lbs. per square foot, was subjected to a fire test of 6 hours' duration, uninjured. Nearly 20 days thereafter the load was increased to 1,960 lbs. per square foot, and the arch still declining to fall, the test was discontinued.

Maximum deflection . . . . 3.41 ins."

May 20, 1897, *Engineering Record*, No. 19, p. 405: —

"A side-construction, hard-burned tile arch loaded with 150 lbs. to the square foot was tested under 5 hours' firing, uninjured. On May 22, 1897, load was increased to 600 lbs. per square foot without injury.

Maximum deflection . . . . 1.84 ins.
Maximum temperature . . 2,050 degs."

Our concrete friends now claim: that an end-construction arch, of our material, but built under their direction, loaded with but 150 lbs. to the square foot, after firing for less than 3 hours, fell in.

Maximum temperature, 2,300 degs.

Maximum deflection, 3.65 ins.

It is an undisputed fact that in the preparation of hollow tile, the raw material (clay, etc.) is subjected in burning to a heat of fully 2,800 degs., sustained for from *6 to 7 days*.

TESTS OF ROEBLING CONCRETE ARCHES.

From report of Stevenson Constable, New York, Sept. 25, 1896, *Engineering Record*, No. 359.

"A Roebling concrete arch, which we are justified in presuming 'represented the standard construction of that Company,' loaded with 150 lbs. per square foot, was subjected to firing for 5 hours. Upon reopening doors before putting water on it was seen that all the plaster and wire netting had burned off except in the extreme corners.

Maximum temperature . . 2,300 degs.
Maximum deflection. . . . 4.485 ins.

Mr. Constable being restrained from interference, we can only quote from report in *Engineering Record*, p. 556, — source unknown to us: —

"The Roebling arch remains intact, with shreds of the skin coat hanging to the ceiling, the brown coat remaining intact.

"2,300 degs. maximum temperature.

"1.4 in. maximum deflection."

Yours truly,

HENRY MAURER & SON.

NEW YORK CITY, Dec. 20, 1897.

Mortar and Concrete.

CHARACTERISTICS OF VARIOUS BRANDS OF AMERICAN NATURAL CEMENTS.

BY CLIFFORD RICHARDSON.

COMPARED with the typical high-grade lime and magnesian cements, which have been described, very considerable variations are found in numerous other brands of the East and West.

Rosendale Brands. The many brands of Rosendale cement from Ulster County, which are on the market, while in general, very similar and of excellent quality, still show very decided differences in certain directions. Some give much stronger mortars, both in initial and eventual strength, than others, and display very considerable variations in their time of setting and density. They show corresponding physical and chemical differences. This is due to the variations in the rock from which they are made. It has been shown to differ in composition in the two principal strata found in Ulster County, and again in different exposures of the same stratum. Along the several miles of outcropping where Rosendale cement is made, extending from Rondout to High Falls, very varied rock is found. In most cases where a deficiency exists, it is in the amount of clay in the limestone. It carries too little, and the cement made from it is hot and lacking in strength. An examination of the analyses of five samples of Rosendale cement, given in a previous table, shows that from 8.68 per cent. of oxides of iron and alumina to 15.20 per cent. is found. This alone would produce a marked difference in the several cements. Further, the magnesia is as high as 19 and as low as 14 per cent., the silica reaches 24 and falls as low as 11. It is easy to see, therefore, that different brands of Rosendale cement, or the same brand at different times, may vary, although the material as a whole is of one general character, and that individual brands can only be expected to be uniform when the greatest care is exercised. The best cement plainly contains, within limits, of course, the most silicates and the least magnesia. It will then be the least fiery and give the greatest returns in the strength for the mortar prepared with it.

Depending upon its origin, Rosendale cement may vary so that tests of sand mortar, 2 to 1, may fall as low as 30 lbs. at the age of seven days and reach 100 lbs. The cement may set slowly or too quickly. It will, eventually, in almost every case, yield results which are satisfactory in so far as that the mortar is dense and not brittle and continues to gain in strength with age, not deterioriating after long periods of time. Mortar of Rosendale cement is particularly desirable for laying up masonry, as it is plastic and trowels well. In concrete it is satisfactory only in the best brands or where a considerable time can elapse awaiting the acquisition of strength. Where centers are to be drawn rapid work cannot be done with Rosendale cements, so that when the Potomac Valley cements are available but little Rosendale is used, while in such work as fortifications and gun emplacements, where slowness of setting is no objection, it is a most desirable material.

Rosendale cement mortar will not withstand frost as well as the lime cements, but is superior in this respect to that made with many other magnesian cements. The greater the amount of magnesia in a cement the less it is able to resist cold weather. Rosendale cement suffers more in strength at an early period from the use of an excessive amount of water in mortar than lime cements and some magnesian brands, but eventually recovers quite or nearly the same strength as when less water is used. A test of a Rosendale cement, initiated in 1892, illustrates this in the following figures:—

	Tensile strength per sq. in. Dry Mortar.	Moist Mortar.
2 parts quartz, 1 part cement.		
7 days	38	20
28 „	68	48
3 months	200	140
6 „	220	198
1 year	246	236
2 years	242	232

It appears that the deficiency in strength of the moist mortar at the age of three months has disappeared when it is one and two years old.

Western New York Cements. The cements made at Buffalo and Akron, in Erie County, New York, are magnesian like the Rosendales, but they differ from the Ulster County cement very decidedly. They often have a greater initial strength, both in neat and sand mortars, but after the lapse of time fail to show the same increase and at times fall below some other cements at the age of a year. To what this is due may be seen on examining their composition. They contain a very much larger amount of magnesia, nearly 26 per cent. as compared to 14 in the best Rosendale, and the amount of alumina and iron oxide is reduced to between 7 and 10 per cent., as compared with 11 to 15. The peculiar differences between the Erie and Ulster County cements is plainly due to this difference in composition, and more especially to the larger amount of magnesia. This has been known to eventually cause some brands of this cement to expand sufficiently to reduce its strength, and in some cases to show a deficiency in strength without apparent expansion. The amount of expansion which takes place with these cements may be seen in the concrete base of asphalt pavements in some cities, which at times are raised into waves several inches high, crossing the streets at intervals. These ridges are so marked that from time to time they must be cut out and the surfaces lowered.

Where the amount of concrete is not extensive, and expansion insufficient to produce heaving, the cements have, in most cases, given sufficiently satisfactory results. Their greater strength, when first used, gives them a certain advantage over other slower cements, but they are plainly not entirely well balanced in composition. The presence of so much magnesia necessitates great care in burning, and considerable variations will be found in the product, depending on the extent to which calcination is carried, and the way in which it is done. Hydration of the burned stone before grinding has, however, improved these cements in recent years. They are in color a very light buff, and are not nearly as dense as the Rosendales. They require less water for working than any other cements, and are very plastic. Their use has extended over a large field of engineering work.

Potomac Magnesian Cements. Several cements are made in the Potomac Valley, not far from where the Round Top lime cement, already spoken of, is burned, which are magnesian in character. They are of local importance only, but are interesting from a technical point of view in comparison with others of the same class. They contain about the same amount of magnesia as the Rosendale cements, and in their best form, nearly as much alumina and iron oxide, but often are deficient in this respect. They are not burned as hard, and so show a greater loss of carbonic acid on ignition. They are distinguished by their color, which is a pale-yellowish buff, from the dark colored cements of Ulster County. They resemble, in the practical results obtained with them, the best forms of Rosendale, and often excel them, troweling well and acquiring strength slowly. In concrete they harden to an extremely tough mass, and with the exception of having a very slow set in cold weather, like all magnesian cements, and acquiring little strength soon after use, are equal to any of the natural cements, especially in their final results. They vary considerably, and should always be carefully tested and watched, but are quite as reliable, as a whole, as any of our magnesian cements. The writer has never seen more satisfactory concrete than has been made with these cements, both in the arches of concrete sewers and in the base of pavements in Washington, D. C.

(*Continued.*)

SAND CEMENT.

EDITOR BRICKBUILDER:—

Dear Sir: — The advent of a new building material will always be received with curiosity and criticism. At first, no doubt, the former will prevail, but soon the latter will assert itself.

It is probable that this is the present state of affairs regarding the use of Silica Portland, or more commonly called "sand cement."

Its use in Europe, especially in Denmark, is an assured fact, and, I believe, success.

In the United States I understand that progress is satisfactory, but probably retarded by the abundance of a high class of Rosendale and other natural cements, as well as high-grade Portlands.

In Canada, the Rathbun Company, of Deseronto, have control of the output of this product for the whole Dominion, and have tube mills producing it not only at their works at Napanee Mills, but have established also a branch in Montreal. I believe they are crowded with orders for months ahead, and certainly, if the enclosed tests are fair indications of the average quality, it is not to be wondered at.

It would appear that the distinctive quality of *high early strength* so prominent in Portland cements is still present, and if this strength maintains itself indefinitely, which there does not seem any reason to doubt, then there is a distinct advantage gained.

Whether "sand cements" of a sliding scale of proportions of sand and cement ground together will be able to meet the various requirements of trade the future alone can decide, but much will depend on the frankness and honesty of the makers. The brand labels of this product should, I believe, state plainly what proportions of the two materials are in each package, or else large avenues of fraud will be open of which the manufacturers are innocent.

TESTS ON "SAND CEMENT."

MADE IN THE MCGILL UNIVERSITY CEMENT LABORATORY.

(*a*) "*Citadel*" *Brand* (1 cement to 1 sand).
Residues on No. 100 Sieve, $\frac{2}{100}$ of 1%.
on No. 180 Sieve, ½ of 1%.
Neat tensile strength, 1 week, 332 lbs. per square inch.
4 weeks, 475 " " "
Neat compressive strength, 4 weeks, 3,837 lbs. per square inch.
1 Sand Cement, 3 Standard Sand — Tensile strength, 1 week, 135 lbs. per square inch.
4 weeks, 141 " " "
2 months, 135 " " "
1 Sand Cement, 3 Standard Sand — Compressive strength, 1 week, 470 lbs. per sq. in.
4 weeks, 687 " "

(*b*) "Ensign" brand (1 cement to 1 sand).
Residues on No. 100 Sieve, $\frac{1}{100}$ of 1%.
No. 120 Sieve, $\frac{1}{100}$ of 1%.
Neat tensile strength, 4 months, 810 lbs. per square inch.
6 " 780 " " "
1 Sand Cement, 3 Standard Sand — Tensile strength, 1 week, 189 lbs. per square inch.
2 weeks, 201 " " "
1 Sand Cement, 3 Standard Sand — Compressive strength, 1 week, 900 lbs. per sq. in.

(*c*) "Jubilee" Brand (1 cement to 6 sand).
Residues on No. 100 Sieve, $\frac{1}{100}$ of 1%.
No. 120 Sieve, $\frac{1}{100}$ of 1%.
Neat tensile strength, 4 months, 340 lbs. per square inch.
6 " 540 " " "
1 Sand Cement, 1 Standard Sand — Tensile strength, 1 week, 300 lbs. per square inch.
2 weeks, 379 " " "
1 Sand Cement, 1 Standard Sand — Compressive, 1 week, 2,800 " " "
1 Sand Cement, 2 Standard Sand — Tensile strength, 1 week, 184 " " "
2 weeks, 215 " " "
Compressive strength, 1 week, 1,225 lbs. per sq. in.

CECIL B. SMITH.

MONTREAL, CAN., Dec. 6, 1897.

The Masons' Department.

THE LICENSING OF CRAFTSMEN.

NOT the least of the beneficial improvements which we owe to organized labor and the trades unions is that which has resulted in the licensing of some of the specialized mechanical occupations. In most of our cities a plumber, a gas fitter, or a steam fitter has to obtain a license from the authorities to follow his trade, and we believe it is generally felt that such municipal regulation is a wise one. Agitations have been made from time to time looking towards the further extension of the licensing system. We are heartily in favor of requiring all master mechanics to pass some sort of examination before being allowed to practise a trade. The interests are too vital and the welfare of the public might be too seriously threatened by neglect or bad workmanship to warrant a disregard of possibilities of control, and we have recently had instances in several of our cities of the results of entrusting building operations to uneducated mechanics. Illinois is the only State so far who has gone even further and has required the architects to be licensed. When such a measure is proposed there is immediately a cry raised of close corporation and a desire to squeeze out the humbler members of the profession who have not had opportunities; but looked at aright, it is not at all a question of the individual, but rather of the community, and there is every reason why an architect should be required to thoroughly understand his business in a constructive sense before he can place himself before the public in a professional capacity. The time has long gone by when mere rules of thumb are sufficient in architecture. In the good old colonial days they built by guesswork. The fact that many of the colonial structures are standing in excellent condition today is due to the very large factor of safety, possibly more correctly termed a factor of ignorance, which sometimes entered into the work; but if any one thinks mere judgment or experience without a substantial backing of positive scientific knowledge is sufficient to erect a modern commercial structure, he will be sadly disappointed with his first practical experience. Architecture is preeminently one of the educated professions, and wholly aside from any question of artistic license, which, to be sure, is quite as desirable as constructive restriction, though more intangible and less readily formulated, the architect cannot be trusted to depend upon the good-wlil of mechanics who might calculate his strains for him and provide against the possibilities of his own ignorance. Architecture ought to be a close profession, entrance to it being closely guarded by legal restrictions which would insure to the community that the man who has a license knows at least the constructive details of his business.

But licensing the architects, obliging them to know their business, does not relieve the builder from a responsibility. It can truly be said that all the architects in Christendom cannot make a good builder out of a poor one, and that if he does not know his business no architect can teach it to him. The two callings are correlated and interdependent, while at the same time there are distinctive features of each that must be mastered. And besides, the fact is that most buildings are not put up under the supervision of an architect. We will go even further, and venture the statement that a large majority of the poorly constructed buildings are put up without any intelligent forethought from either architect or builder. An owner wishes to economize, and not only dispenses with architectural services, but takes the lowest bidder who will assure him that he knows how to do it. Of course we blame the owner for such shortsightedness, which, however, is more often due to ignorance than to the intent to build poorly; and right there is where the city has a perfect right to step in and insist that the builder shall know his business, shall be competent to decide on all general points of construction, and that before he can be called in to put up even the humblest structure he must receive approval and a license from the community. We hope the work of municipal regulation may go on and extend, for if properly regulated it cannot but be of value to the

community, besides elevating and improving the condition of the mechanic and the architect.

HIGHER TECHNICAL EDUCATION.

THE subject of licensing of craftsmen is naturally associated with provision for a higher technical education in the mechanic arts. As we survey the situation, the organization of our building trades, as relates to the craftsmen themselves, is on the whole not as favorable for individual development as it was a few generations ago, when the apprentice system, with all its defects and limitations, did manage to turn out a very fair quality of workman, who at least understood his tools, and had had experience under the eye of a master who knew more than he did. The apprentice system to-day is a theory rather than a fact in most of our cities. For it the best substitute is afforded by the mechanic schools, which, in their possibilities, are undoubtedly far superior to any apprentice system, but which need to be largely broadened in their scope, and brought more closely in harmony with actual handicraft to be of the immediate value which those who are interested in them believe they should be. A good bricklayer need not possess a knowledge of integral calculus. We question even if he need a very special knowledge of even the lower forms of mathematics. But an intelligent appreciation of the material which he uses, the way in which it acts, and why it is used as it is, is quite as essential as a mere manual dexterity in the use of a trowel and cold chisel. There are some ideas which die hard with the average mechanic, such as the theory, for instance, that putting lime in cement mortar in cold weather improves the quality of the mixture and keeps it from freezing. If our manual trained bricklayer were properly instructed he would know better, and would, we venture to say, feel a keener interest in building his wall properly and using mortar in a logical as well as scientific manner. Now every one, even in this enlightened age, cannot have a technical education, and yet every one in our free country aspires to a higher position than the one he is born to; and in proportion as the intelligence of the individual craftsman is raised, it goes almost without saying that the resulting work is going to be better because of the possibilities of growth which it puts within the reach of the mechanic himself. Intelligent work is always more economical, even if the price per hour is greater. In the Southwest the saying is that it takes two Indians to do the work of one Mexican, and two Mexicans to do the work of one Eastern laborer. It isn't because there is more muscle in one case than in the other, but it is because of the intelligence which directs the hand, so that the trained mechanic is cheaper at five dollars a day than an unthinking laborer at one dollar.

UNDERPINNING HEAVY BUILDINGS.

SOME one has aptly characterized the difference between mediæval construction and the more recent methods as being typified by the use of the nail and the screw, our modern construction being put up so it can be taken apart, whereas the medieval work was put in place to stay. An even more striking development of modern work is in the line of adding to a building in its vital constructive features after it is all done and occupied, a feat which would presumably have been undreamed of in the building periods of the past; but with our rapid modern growth it is every year found more and more desirable to make radical changes in existing structures, and the partial reconstruction of buildings has developed into a very interesting and quite exact science, notably in as far as relates to the underpinning or extending downward of the foundations of a building. This is a department of building which is intensely fascinating to even the most unprofessional observer, and one appreciates the capabilities of modern science more fully by following in detail some of the devices which have been forced upon constructors in our attempts to obviate the existing weaknesses of foundations, or to provide suitable supports for increased loads. The time was when foundations were put in to stay, and the thought of sinking them deep and making them broad implied a permanence which would never be disturbed. But with our modern scientific agencies we can pick up a building, hoist it in the air, build under it to almost any extent, or move it bodily for a considerable distance, not only with perfect safety and surety of results, but with an ease of operation which is a constant source of surprise even to those who are intimately associated with this kind of work. The subject forms a distinct chapter in the development of our national constructive architecture, and merits so much more than a passing note that it is our intention at an early date to take it up in detail and illustrate the subject by a series of articles which shall show what has been done in notable instances. It has special relevancy to our own peculiar field, brick having been found peculiarly adapted for the underpinning of heavy buildings, inasmuch as limitations of space usually forbid the employment of a bulky material, and brick has naturally been adopted because it affords an opportunity for thorough construction even when applied under most disadvantageous conditions. A number of the heaviest buildings in the world rest upon brick foundations, which were put in place under conditions which would have been prohibitory for any other material.

STAINING BRICKS.

IT frequently happens that a builder has to build an addition to some brick building already up; and it also happens that he cannot procure bricks to match the old bricks in color. To get over this difficulty he is compelled to use bricks available and render them the color of the old bricks by staining, or staining the old bricks to correspond with the new. There are several methods — all good — of staining bricks, and for the benefit of those builders who may require to employ one or other of the methods we submit the following: To make a good durable red stain, mix Indian red, or Venetian red, with a solution of good Portland cement, regulating the color by adding a little Spanish brown if necessary. Mix with this fine sand, washed clean and dried, before being added to the solution. Cement and sand may be used in equal proportions. The mixture is to be a little thinner than ordinary paint. It must be stirred while being used, and applied with a brush. Another red stain, which is easily applied, looks better than the first, but lacks durability. Take as follows and in proportion to amount required: One ounce of glue melted in one gallon of water, add a piece of alum the size of an egg, then a half pound of Venetian red, and one pound of Spanish brown. Try the color and mix more light or dark to suit. For a buff or cream color, use any yellow mineral paint, such as yellow ochre, adding a mineral white to make it light if necessary. For black, use asphaltum heated to a fluid state before applying. Bricks should be stained black before being laid, and the best way is to make the brick moderately hot, then dip them about one inch in the melted asphaltum, and leave them to dry before being used. This makes a good, durable job, if they are held in the mixture for a moment or two in order that the color may have an opportunity of being absorbed to the depth of a sixteenth of an inch. Another method of staining bricks black is to mix together asphaltum and linseed oil, and heat the mixture until it will mix together well. Heat the bricks and dip them in the mixture, where they should remain for a short time. The best way to stain black is to have a flat pan over a fire; fill the pan until it has about an inch in depth of the mixture. Place in the pan as many bricks as it will hold, then take out the first brick and replace it with another. Put the stained brick on a board or a clean spot to dry; then take out the second brick and put another in its place; and continue this operation until brick enough are stained, minding to keep up the supply of asphalt and oil. — *Canadian Architect.*

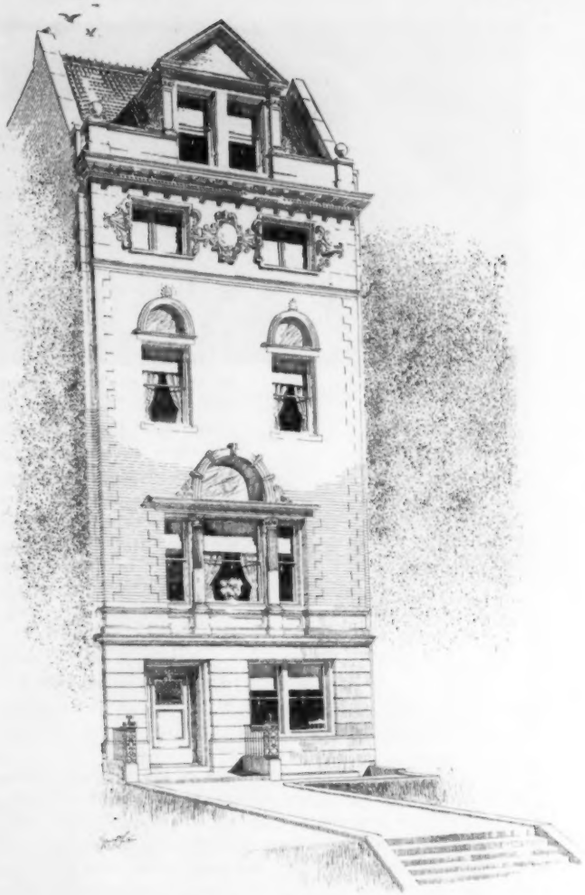
RIGHTS OF PURCHASER OF EFFECTS OF INSOLVENT CONTRACTOR: Where one buys at sheriff's sale the property of a contractor who has failed, and assumes the place of the contractor, under a partially performed building contract, and completes the work for him, he is entitled only to the amount which would have been due the contractor who had been overpaid for the work already done by him.— *Superior Court of Pennsylvania.*

Recent Brick and Terra-Cotta Work in American Cities, and Manufacturers' Department.

NEW YORK. — As would naturally be expected, the month of November was quiet in regard to real estate and building transactions as compared with the many active months preceding, but the records show a healthy improvement over the corresponding month of '96. The most important event of the month was the decision of the competition for the New York Public Library and the award of the contract to Carrere & Hastings, architects; an award

TERRA-COTTA FIGURE, HARTFORD TIMES BUILDING, HARTFORD, CONN.
A. W. Scoville, Architect.
Executed by the Conkling, Armstrong Terra-Cotta Company.

received with great satisfaction by all; and from the illustrations published, we can predict that New York will become the possessor of a beautiful building of which we can be justly proud. The building will be erected on the site of the old reservoir at 42d Street and Fifth Avenue. Nearly $3,000,000 will be expended, and the time occupied in building will probably be at least three years. The competition for this building was the most important since the Episcopal Cathe-



HOUSE AT WASHINGTON, D. C.
A. S. Bell, New York, Architect.

dral, and we may safely say that no competition was ever more successfully or honorably conducted.

Soon after the decision of this competition the same architects were awarded the new building for the Academy of Design, another large and important work which will cost $400,000. The plans of Arthur A. Stoughton, architect, for the new Army and Navy Memorial Building in Central Park, have been accepted.

HAMILTON SCHOOLHOUSE, TRENTON, N. J.
W. A. Poland, Architect.
Front brick made by Oliphant & Pope Company.

TERRA-COTTA DETAIL, JEWELERS' EXCHANGE BUILDING, BOSTON.

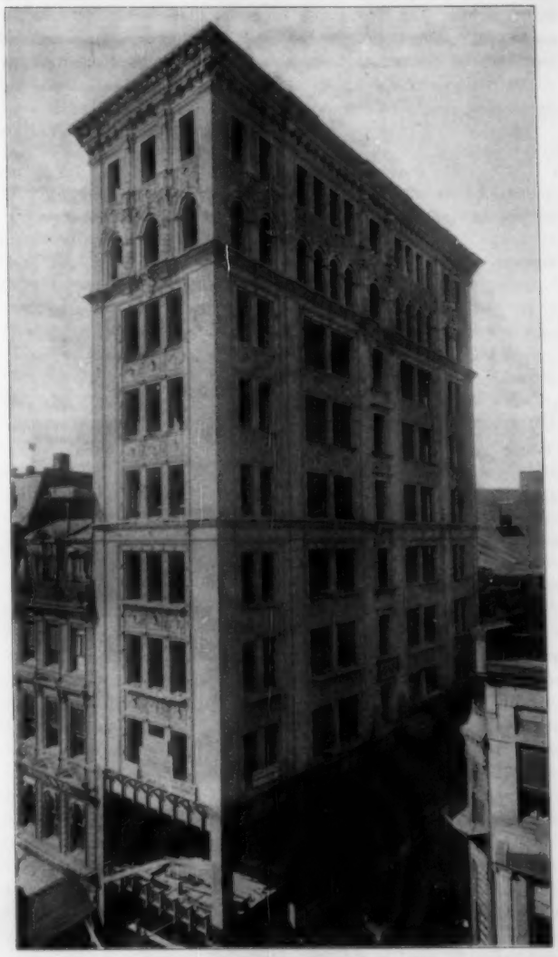
Three five-story brick public school buildings, cost aggregating $750,000, are to be built at once. They will be located on 104th Street, near Second Avenue, 111th Street, near Lenox Avenue, and 104th Street, near Fifth Avenue. Frederick C. Zobel, architect, has prepared plans for a ten-story brick and stone fire-proof store and office building 75 by 100 ft., to be erected on 23d Street, near Lexington Avenue. Cost, $250,000.

Neville & Bagge, architects, have planned four five-story brick and stone flats and stores to be built on 112th Street, corner Fifth Avenue. Cost, $100,000.

BOSTON. — The two closing months of the year are seldom active ones in the building industry in the way of the giving out of new work for estimates. While these months of the present year have developed no extraordinary exceptions to this general rule, yet they have certainly shown a decided improvement over the corresponding months of 1895 and 1896; not only in Boston, but in New England generally. Considerable work projected last year and the year before, which was "pigeon-holed" pending improvement in general business conditions, has now gone ahead, and the plans for same given out for estimates or the contracts awarded.

TERRA-COTTA DETAIL, JEWELERS' EXCHANGE BUILDING, BOSTON.

One feature in connection with the stations of the Subway now open to the public is certainly open to criticism, and points to a moral distinctly favorable to the using of enameled brick or glazed terra-cotta as a covering for the iron columns or posts in public buildings in which a hurrying, crowded mass of people congregate. The posts which support the roofs of these stations are of iron encased in cement, square in form, and of about 20 ins. in diameter. When new, these posts were painted with some preparation which gave them a white, smooth surface, which did not last long, however, when they were exposed to the wear and friction of the passengers coming in contact with them. At the present time, although the stations have been in use but little over three months, these posts present a soiled, dingy aspect, but little in harmony with the glistening white of the enameled brick walls. Had the posts been encased with enameled or glazed tile they would have preserved a clean, attractive appearance, indefinitely. We are confident that the comparatively small increase in the cost of thus encasing these columns in tile, instead of cement, would be more than offset by the permanent character of the finish, which would require no attention



JEWELERS' EXCHANGE BUILDING, BOSTON.
Winslow & Wetherell, Architects.
The exterior is built entirely of cream-colored terra-cotta, executed by the Perth Amboy Terra-Cotta Company, and furnished through their New England agents, Waldo Bros., Boston.

and care beyond, perhaps, an occasional washing in soap and water; whereas, with the cement surface, there must be frequent repainting, at some expense, and at inconvenience to the traveling public.

It is to be hoped that in the stations now under process of construction in the sections of the Subway not yet completed, that the columns will be treated in the way suggested. This has been done most successfully in the Subway Station of the Illinois Central Railroad, Chicago, where all the columns supporting the roof are enclosed in glazed terra-cotta tiling.

Work on the New South Terminal Station continues to advance rapidly, and it is estimated by the engineers that about one third of the entire undertaking has been completed, showing that progress on the same has been fully up to contract time. The walls of that portion of the station technically known as the head house are now up to the second story, leaving three stories yet to be built according to the present plans. It is expected that the work of setting up the frame for the train shed will begin during January.

TERRA-COTTA DETAIL, JEWELER'S EXCHANGE BUILDING, BOSTON.

Among the new buildings now under process of construction or soon to be erected may be mentioned a $75,000 apartment house at Brookline; J. F. & G. H. Smith, architects; to be built of gray brick.

RESIDENCE AT PITTSBURGH, PA.
George S. Orth, Architect.
Front brick made by the Harbison & Walker Company, Pittsburgh, Pa.

Two residences for Francis Morton on Sutherland Road; Cabot, Everett & Mead, architects; to be constructed of brick. A mercantile building for John T. Morse, Jr., on the corner of India Street and Atlantic Avenue; W. T. Sears, architect. A brewery for the Star Brewing Company, at Roxbury, Otto C. Wolfe & Son, architects, Philadelphia; to be constructed of brick. A $50,000 business block in Malden; Tristram Griffin, architect; to be constructed of brick. A $40,000 schoolhouse at Watertown, plans for same being open to competition for architects residing in Watertown; to be constructed of brick. An insane asylum, to cost $150,000, at Cranston, R. I.; E. T. Banning, architect, Providence; to be constructed of brick and stone. New Court House at Chelsea, to cost $50,000; Wilson & Weber, architects, Boston; to be constructed of brick. New chapel at Providence, R. I., to cost $100,000; Martin & Hall, architects, Providence; to be constructed of brick and stone. Church at Hartford for the Pearl Street Congregational Society, to cost $100,000; Flagg & Bartlett, New York City, architects; to be constructed of brick and stone. A physical laboratory for Dartmouth College, Hanover, N. H., to cost $50,000; Lamb & Rich, architects, New York City; to be constructed of brick. A new jail at Fall River for Bristol County; Lewis M. Destramps, Fall River, and Nat. C. Smith, New Bedford, architects; to be constructed of brick and stone. A new Court House at Worcester, to cost $375,000; Andrews, Jaques & Rantoul, architects. A society building, to cost $18,000, at Derby, N. H., for the I. O. O. F. Society; Geo. G. Adams, architect; to be constructed of brick. A new combination store and office building at Providence, R. I.; Wm. R. Walker & Son, architects; to be constructed of buff brick and terra-cotta. The Phœnix Hall at Brockton (steel frame fire-proof building); Fuller, Delano & Frost, architects, Worcester; to be constructed of brick and stone. A new $30,000 dormitory for Smith's College, Northampton, Mass.; W. C. Brocklesby, architect, Hartford. Home for Aged Couples at Manchester, N. H.; William N. Butterfield, architect, Manchester; to be constructed of brick. A $25,000 cold storage plant at Waterbury, Conn.; A. B. Pinkham, architect, Boston; to be constructed of brick and terra-cotta. A new school-house, to cost $25,000, at Mattapoisett, Mass.; Charles Brigham, architect, Boston; to be constructed of brick. The high school at East Boston, for which plans were in competition, has been awarded to John Lyman Faxon, and is to be constructed of brick and stone. The schoolhouse for Haverhill, Mass., has been awarded

MT. ALOYSIUS ACADEMY, CRESSON, PA.
Alden & Harlow, Architects.

to C. Willis Damon, architect, Haverhill; to be constructed of brick and stone. A new $60,000 schoolhouse at Malden, Mass. Plans in competition; to be constructed of brick. A new combination store and office building at Worcester, to cost $75,000; Earle & Fisher, architects, Worcester; to be constructed of brick and stone.

CLEVELAND. — The second annual exhibition of the Cleveland Architectural Club closed November 27, after a successful run of two weeks, on the tenth floor of the New England Building, where ten large rooms and the corridor were completely filled with between 700 and 800 different drawings, photographs, water and oil colors, statuary, and the advertising exhibit.

The exhibition was divided into two parts: the regular architectural work and the exhibits by advertisers.

In the latter, interesting and artistic exhibits were made by all who took space in the catalogue. Three of the rooms were devoted to this feature.

The memorial collection of the life work of Richard Morris Hunt, loaned by Mrs. Hunt and Mr. R. H. Hunt, was given the place of honor, being located opposite the main entrance. It proved of much interest to all patrons of the exhibition.

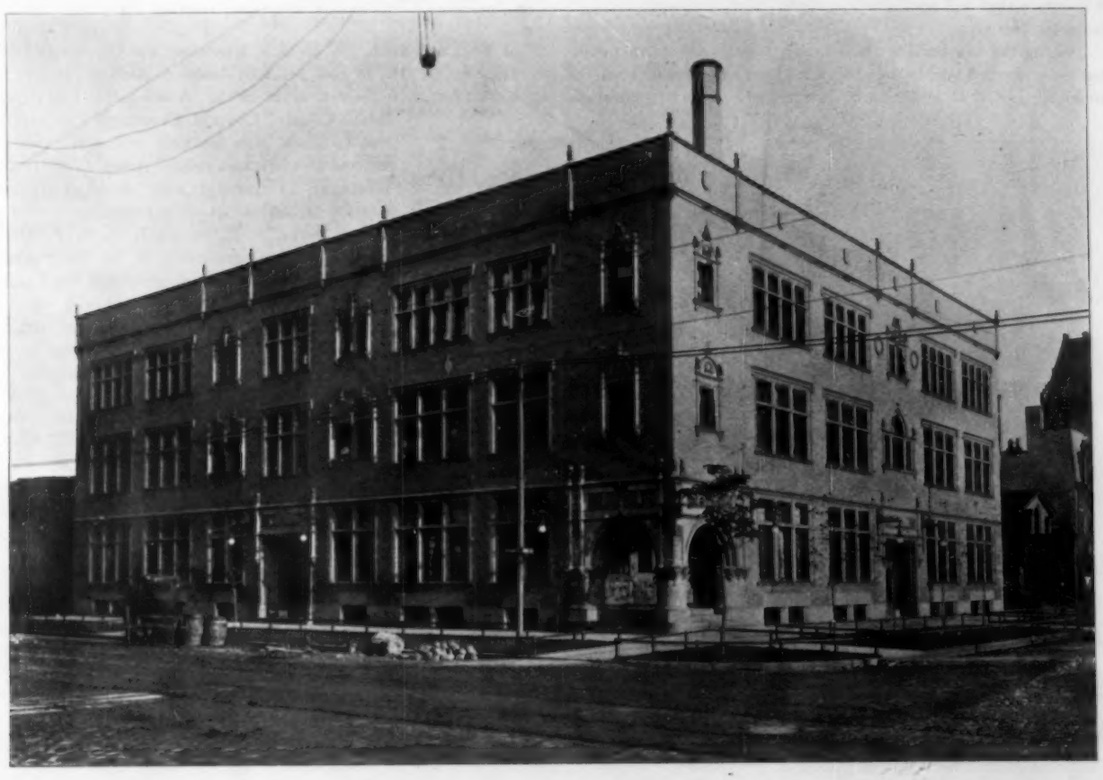
The work of the architectural schools attracted much attention, and many questions were asked regarding methods and courses of study of these institutions; Harvard, Columbia, Atelier Masquery, University of Pennsylvania, Philadelphia School of Industrial Art, and Cornell being represented. The drawings by students of the Eçole des Beaux Arts, Paris, exhibited by, and the property of Cornell University, were most carefully and critically examined for their wonderful technical value. They were twelve-hour problems.

The government exhibit of post-offices and custom houses, recently exhibited at the Nashville Exposition, was also of interest, because of the advance shown in the design of many of the buildings. Especially interesting were the two designs rendered by Messrs. D. A. Gregg and C. D. Maginnis.

Boston was well represented by the work of Messrs. Blackall, Freethy, Gregg, Le Boutillier, Little & Browne, Schweinfurth, Peabody & Stearns, and Winslow & Wetherell.

The design for the new Cleveland Chamber of Commerce, by Peabody & Stearns, was very much admired.

The exhibition possessed one feature of merit which popularized it with the public, *i. e.*, its many exquisite water colors. So many and varied were they that every room was given a goodly quota. Of these, the work shown by Messrs. Ross Turner, J. A. Schweinfurth, Geo. P. Fernald, A. Kahn, Emil Lorch, Chas. S. Schneider, W. M. Hall, W. D. Benes, Frank A. Hays, Jamieson, and A. C. Mûnoz, and Misses Reade and Burgess deserves prominent mention.



GOODRICH HOUSE, CLEVELAND, OHIO.
Coburn, Barnum, Benes & Hubbell, Architects.

In interior decorations many pleasing designs were shown; those by Messrs. W. T. Supplee, Nicola d'Ascenzo, and G. Ketterer, of Philadelphia; Louis Rohrheimer, Cleveland; and Misses Christia M. Reade and Ida J. Burgess, of Chicago, being the most meritorious.

The work of the Cleveland Club consisted of the competition drawings of the year past, and that of its individual members. Coburn & Barnum exhibited two views of a residence now building for Mr. W. H. Lawrence, at Dover Bay Park. This house is of brick and terra-cotta, with tile roof, with interior construction of steel and fire-proofing.

Coburn, Barnum, Benes & Hubbell (firm now dissolved) exhibited views of the Goodrich House and Western Reserve Historical

ENTRANCE, GOODRICH HOUSE.

Society Building, both brick and terra-cotta buildings, the latter being absolutely fire-proof.

Knox & Elliot made a very interesting show of their work Granger & Meade occupied a goodly space with residence work, in which they have become so successful. Willard Hirsh's design for one of Cleveland's branch libraries attracted deserved attention. The building is in Roman brick and is well executed. Chas. W. Hopkinson made a goodly showing of executed work. Hubbell & Benes showed a number of clever designs of proposed buildings. Lehman & Schmitt's designs for an office building and residence of F. W. Bruch commanded attention. Arthur N. Oviatt's views of the Century Club were much admired. These club rooms are located on the fifteenth floor of the New England Building and are the finest in the city. W. W. Sabin's design for Eldred Hall at W. R. U., and Wm. R. Watterson's competitive design for the Cleveland Chamber of Commerce were carefully inspected.

The catalogue issued for the exhibition has received many flattering comments, and such a demand has been made for it that the issue is nearly exhausted.

PITTSBURGH.—There has been considerable activity in the building line during the fall. Many of our architects are now engaged on competitive drawings or laying out new work for next season, which would indicate considerable business for the coming spring. The Washington county commissioners have invited six architects to compete for the new court house plans; among those of this city are W. Kaufman, F. J. Osterling, and F. C. Sauer. The Pennsylvania Railroad Company will soon have plans ready for a new Union Depot to be erected on the site of the present structure. The Daughters of the Revolution have authorized Architect Miss E. Mercur to prepare plans for a custodian building which will be erected on the old Block House property at the Point. The school directors of the Third Ward, Allegheny, have adopted the plans submitted by Architect F. C. Sauer, for their new school building. Architect Joseph Anglin will prepare plans for a three-story brick and stone hall building, 60 by 120, for the Fraternal Hall Association, to be erected at McKee's Rocks. Architects George Orth & Brother are preparing plans for a three-story brick warehouse for Jacob Graff, to be erected on Penn Avenue, East End. Architect Sidney Heckert has prepared plans for a large residence, to be built of Pompeian brick and stone, for Harry Robins, and to cost $45,000.

INTERESTING NEWS ITEMS.

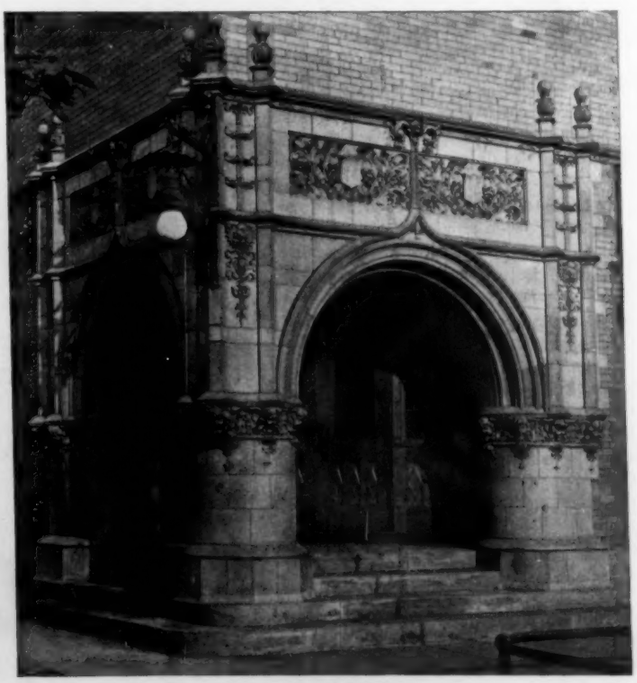
THE CUMMINGS CEMENT COMPANY have secured another large contract to furnish their Obelisk (Natural) and Storm King (Portland) brands for canal work. This will necessitate running the works most of the winter.

THE Bolles Sliding and Revolving Sash have been specified for the new twelve-story office building corner Charles and Fayette Streets, Baltimore, Md.; Winslow & Wetherell, architects, Boston, Mass.

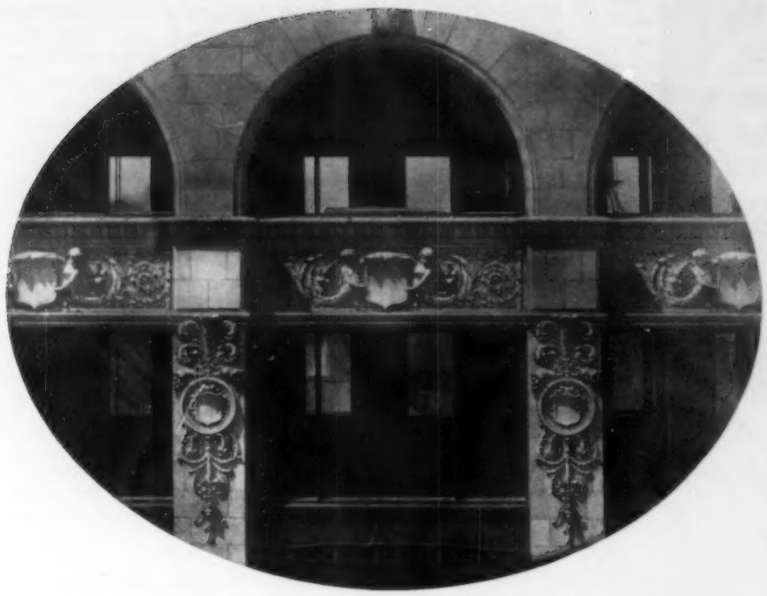
O. W. PETERSON & Co., Boston, have removed their office from 611 to 505 John Hancock Building. They now have a fine exhibit room, in which is shown a full line of dry pressed and stiff mud-clay products.

WALDO BROTHERS have secured the contract for furnishing Atlas Portland cement to B. T. O'Connell, for approach of new Charlestown (Boston) bridge. The price was considerably in excess of other American Portlands, but Atlas was the only brand submitted that passed the test.

THE HYDRAULIC-PRESS BRICK COMPANY, of St. Louis, have closed contract with Drainage Commission, of New Orleans, La., for 100,000 enamel brick for various pumping stations; work to commence at once. They are now putting on the market a white brick with an impervious non-absorbent face and without a glaze. On



MAIN ENTRANCE, GOODRICH HOUSE.



PORTION OF FRONT OF BUILDING FOR EVANS ESTATE, BUFFALO.
E. A. Kent, Architect.
Terra-Cotta executed by the Northwestern Terra-Cotta Company.
(The whole front of this building is of terra-cotta.)

account of the increased demand for enamel brick they have been compelled to add to their already large kiln capacity.

THE winding iron stairs in the building of the Boston Art Club, on Dartmouth Street, have been covered with their protective device by the American Mason Safety Tread Company, constituting a safeguard which will be much appreciated by members and guests of the club.

WALDO BROTHERS will supply Atlas Portland cement to Joseph Ross for work at foot of Summer Street, Boston, part of Terminal Station improvement, the cement being approved by Wm. Jackson, city engineer, after careful tests.

HOLBROOK, CABOT & DALY have purchased of Waldo Brothers Atlas Portland and Hoffman Rosendale for their contracts for city of Boston abutments at Back Bay Fens, also for New York, New Haven & Hartford Railroad work at Readville, Mass.

THE CELADON TERRA-COTTA COMPANY, LIMITED, Charles T. Harris, Lessee, has closed contracts for roofing tile for Emerson Hall, Beloit College, Beloit, Wis., wave pattern; Patton & Fisher, architects, Chicago. Residence for Wm. Guernsey, Chicago, 8 in. Conosera, Geo. L. Harvey, architect. Residence for Nathan Herzog, Chicago, open shingle; Handy & Cady, architects.

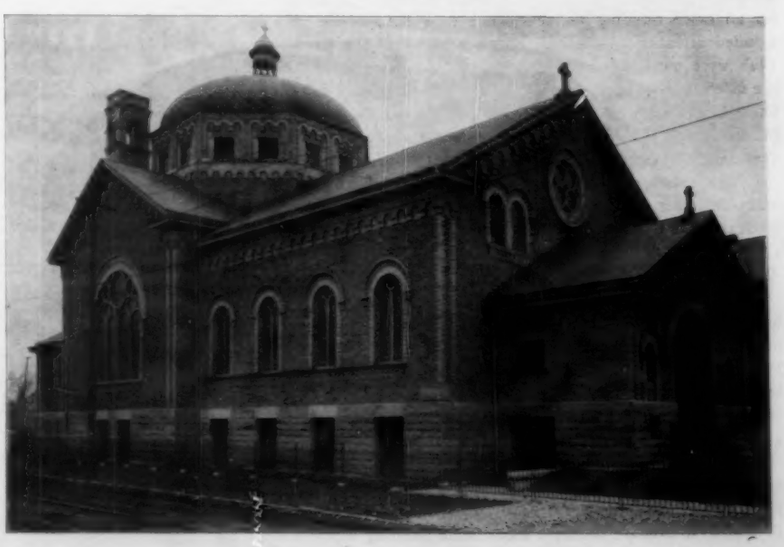
THE architectural terra-cotta for "The Westminster," Copley Square, Boston, H. E. Cregier, architect, Woodbury & Leighton, builders, will be furnished by Waldo Brothers, who are agents for the Perth Amboy Terra-Cotta Company. This is the largest contract for terra-cotta which has been awarded in Boston in a long time.

THE DAGUS CLAY MANUFACTURING COMPANY, manufacturers of front brick, report a business that keeps their plant running on full time. They have recently opened a new clay bank, located on their premises, which yields a clay that makes a very handsome shade of buff brick. Among the contracts recently closed by this company is one for 40,000 pink Roman brick for a residence at Buffalo.

MR. JAMES R. PITCAIRN, of 337 Fifth Avenue, Pittsburgh, Pa., is now the Pittsburgh agent of the Ridgway Press Brick Company, of Ridgway, Pa. Mr. Pitcairn, although having had the agency of the "Ridgway" product for but a few months, has already furnished their mottled grays for two very creditable operations, and their stiff mud buffs for two more, and has now orders in at the factory for four large operations to be built of mottled gray Roman brick.

ANTHONY ITTNER, the well-known brick manufacturer of St. Louis, reports a decided improvement in his business. The demand for his pressed and ornamental bricks for shipment to distant points has been a conspicuous feature of his business for the year. One of these orders called for 100,000 bricks to be shipped to Dallas, Texas, for the St. Paul's Sanitarium, and another for a shipment to Fort Cook, Neb.

POWHATAN CREAM-WHITE BRICKS have been used in the following operations in New York City: Apartment house, 107th Street, near Amsterdam Avenue; W. J. Casey, builder. Apartment house, northwest corner 86th Street and Central Park West; James



ST. FRANCIS CHURCH, COLUMBUS, OHIO.
Yost & Packard, Architects.
Built of rock-faced and plain bricks, made by the Columbus Brick & Terra-Cotta Company.

Livingston, builder. Business building, 590 Broadway; J. A. Zimmermann, builder. Light Courts St. James Building, Broadway and 26th Street; S. E. Moore, contractor.

THE CENTRAL FIRE-PROOFING COMPANY have recently taken contract to furnish and set in place, the terra-cotta fire-proofing for Bellefield Hotel near Pittsburgh. They are now furnishing and setting fire-proofing for the Land Title & Trust Building, Philadelphia, and Arbuckle Sugar Refinery, Brooklyn. They are also furnishing material for Pavilion Building, Boston, Astoria Hotel, Syndicate Building, Park Row, Columbia College Building, New York University Buildings, and many others in New York city.

THE RIDGWAY PRESS BRICK COMPANY, through their Pittsburgh agent, Mr. Jas. R. Pitcairn, are furnishing the mottled gray Roman brick for Joseph Horne & Co.'s new six-story store building at Pittsburgh.

Joseph Horne & Co. are the largest wholesale and retail dry goods, etc., dealers in Western Pennsylvania, and this store, when completed, will make a notable addition to Pittsburgh's already long list of fine buildings. Peabody & Stearns, of Boston, are the architects; Henry Shenk & Sons, general contractors; and C. B. Lovatt & Bro. are the bricklaying contractors.

A CITY RESIDENCE.
Hobart A. Walker, New York, Architect.

WE are in receipt of a very attractive pamphlet of some ten pages from the Illinois Steel Company, Chicago, describing the character and merits of their steel cement. This cement is manufactured mainly from the blast furnace slag obtained from the smelting of iron ores. It is ground to the greatest possible degree of fineness and is claimed to be particularly desirable for heavy concrete work where high strength is required. In the pamphlet is also recorded a number of tests of steel cement. Accompanying these tests there are some very flattering testimonials from prominent concerns who have used the cement and endorse it as being entirely satisfactory.

STORE BUILDING, DETROIT, MICH.
Gustav A. Mueller, Architect.

A NEW candidate for honors in the way of enamel brick is the Pennsylvania Buff Brick and Tile Company. Office, Trenton, N. J.; works at Saylorsville, Pa. For the past two years the company have been conducting a line of experiments on enamel bricks in an extensive way, and are now turning out a most desirable article. During the last six months they have made many alterations and additions to their already extensive plant in order to be fully equipped to handle to the best advantage the large business they anticipate on this branch of their output. The conservative, methodical progress which the company has made in the production of satisfactory enamels would indicate that they are upon a proper basis to satisfactorily supply the demand for a good enameled brick.

THE PANCOAST VENTILATOR COMPANY has bought out the interest of Mr. R. M. Pancoast, who has resigned the vice-presidency and withdrawn from all connection with the company. They report a very gratifying increase in their business. Beside the contract for supplying the ventilators for the Astoria Hotel and a ten-foot ventilator for the Manhattan Beach Theater, they have had them specified for the new Liberty Silk Mills, at 57th Street, New York, and a 66 in. one for the Purdue University, of Lafayette, Ind. In addition to their regular line of ventilators, they have a new Common Sense ventilator, which is much appreciated by those in offices and sleeping rooms.

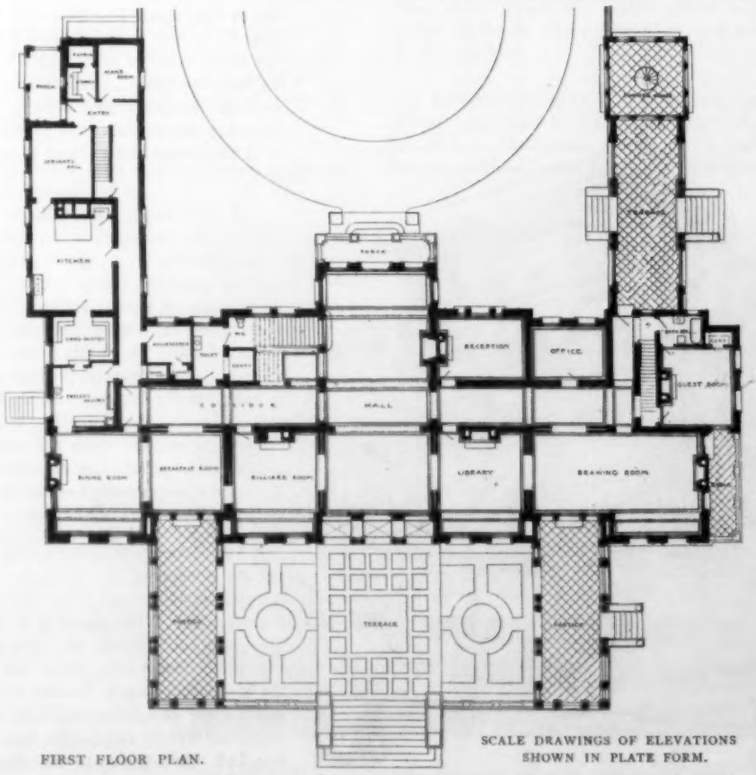
THE COLUMBUS BRICK AND TERRA-COTTA COMPANY have closed the following contracts to supply their bricks in New York City: Two flats, 112th Street, light-gray standards; Edward Wenz, architect. Four flats, 119th Street, light-buff standards; John Brandt, architect. Flats, 116th Street, dark gray Romans; G. A. Shellinger, architect. Grammar School No. 13, Huston Street, light-buff standards; C. B. J. Snider, architect. Stable and dwellings, 77th Street, terra-cotta Romans; A. M. Welch, architect. Two flats, 103d Street, dark-gray Romans; G. F. Pelham, architect. Office building, Broadway and 19th Street, gray speckled Roman. The following list of buildings in other localities are being supplied with their bricks: Arnold Building, Knoxville, Tenn., light-gray standards; Baumann Bros., architects. Stores and offices Napoleon, Ohio, gray standards; E. O. Fallis, architect, Toledo, Ohio. "Majestic" apartment, Atlanta, Ga., light-buff standards; Willis F. Denny, architect. Chapel, Soldiers' Home, Dayton, Ohio; dark-buff standards. Residence, R. H. Morrison, Charleston, W. Va., terra-cotta Romans; Harrison Albright, architect. Bank, Tarrytown, N. Y., light-buff standards; Robertson & Manning, architects. Store, Elder & Tuttle, Springfield, Ohio, terra-cotta and gray. Burt's Theater, Toledo, Ohio, light-buff and dark-gray standards; Mills & Wachter, architects.

COURT, HOUSE FOR H. H. COOK, ESQ., LENOX, MASS.
Peabody & Stearns, Architects.

WE have recently had our attention called to the Standard System of Slate Fastening as being one which combines many good points in the fastening of slate shingles and obviates many bad ones, and we are glad to bring the same to the further notice of our readers. This system is known as the Standard Slate Fastener, and is a simple yet most practical device for the securing of slates to the roof in an absolutely rigid manner. The fastener is made from galvanized steel wire cut in lengths from 4 to 5 ins., bent at one end in the form of a crook, and at the other, so as to make a sharp angle at about 1½ ins. from its termination. This end is made with a sharp point and is to be driven to the depth of its elbow into the roof proper, which brings the main shank of the fastener flush with the roof, and allows the crook to project to its own height (½ in.).

The end of the slate at about its center is then slipped into the crook and held there in a secure manner. As the fastener is from 2 to 3 ins. in length from the elbow to the crook, it allows the next layer of slate to overlap the preceding one just that distance, and as each fastener is driven between the joints, there is no punching of holes in the slate. The fastener comes also with snow-guard attachment if desired. It is claimed by the company that 50 per cent. is saved in time of laying slate by the use of this system over any other.

Parties interested may obtain full information by writing the manufacturers, Hamblin & Russell Manufacturing Company, Worcester, Mass.



FIRST FLOOR PLAN.

SCALE DRAWINGS OF ELEVATIONS SHOWN IN PLATE FORM.

HOUSE FOR H. H. COOK, ESQ., LENOX, MASS.
Peabody & Stearns, Architects.

WE are in receipt of the new illustrated catalogue issued by Henry Maurer & Son, New York City. This is a particularly interesting work of about one hundred pages, and shows every evidence of great painstaking in its compilation; while primarily its object is to describe the particular products of the above-named company, yet there is incorporated in its pages much general information regarding

the practical use of burnt-clay fire-proofing. Several pages are devoted to the enumeration of a list of over three hundred large buildings, located in various parts of the country, for which the company furnished the fire-proofing. Following this are some sixty pages devoted to a full and comprehensive description of the various fire-proof arches, partitions, furring, column covering, roof and ceiling tiles, etc., which the company manufactures. These are further explained by twenty-two colored plates, illustrating their various purposes. In connection with this portion of the catalogue there are introduced a number of interesting extracts from articles written by various authorities pertinent to the subject of proper fire-proof construction, also a review and criticism of some public tests of fire-proofing made at different times in New York City and elsewhere.

In the closing pages of the catalogue there are twenty-nine full-page half-tone illustrations of prominent buildings recently constructed in New York and Philadelphia, for which this company supplied the fire-proofing. The general excellence evinced in the arrangement of the catalogue, and the real value of the matter encompassed in its pages makes it a volume to be desired by all interested in the subject of fire-proof construction.

RESIDENCE OF H. H. COOK, ESQ., LENOX, MASS.
Peabody & Stearns, Architects.

The New York and Rosendale Cement Company furnished 65,000 barrels of cement for the New York Croton Aqueduct during 1897.

The tests of Portland cement usually made as to fineness, tensile strength, at one and four weeks' setting, etc., do not afford an opportunity to ascertain if the cement under test possesses other qualities which for practical purposes are equally if not more valuable. The customary tests of cement give no evidence regarding its strength when mixed with a larger proportion of sand, regarding its uniformity, constancy of volume, durability, adhesiveness, impermeability, resistance to violent changes of the atmosphere, and to abrasion by wear. Information as to these qualities can only be obtained by the observation of long-time tests, the results of the employment of the cement in practise, which must be taken into consideration, together with the results of the usual tests, to form a judgment of the relative value of several cements.

The Dyckerhoff Portland Cement will pass the requirements of all tests compatible with the best quality, and the well-known results of its employment for more than thirty years have demonstrated that it possesses in the highest degree all the qualities desirable in a Portland cement, and justify the reputation that the Dyckerhoff is the best Portland cement made.

Mr. E. Thiele, 78 William Street, New York, is the sole agent for the United States for the Dyckerhoff Portland cement, and will be pleased, on application, to forward a pamphlet describing this cement more fully, and containing directions for tests, employment, and testimonials.

The Dyckerhoff Portland cement is for sale by Messrs. Ham & Carter, 560 Albany Street, Boston, and all the leading dealers in building materials throughout the country.

The Union Akron Cement Company, Buffalo, are supplying the cement for the new brewery building at Washington, Pa.; also large quantities of cement for work on the Erie Canal.

A Fireplace Mantel
made of
Ornamental Brick.

Our mantels are the best.
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tells all about 52 designs
costing from $12 up.
Send for it before you
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The Dyckerhoff Portland Cement has been used in the Metropolitan Sewerage Construction, Boston, and is now being employed in the construction of the Boston Subway, Howard A. Carson, Chief Engineer.

Pamphlet with directions for its employment, testimonials, and tests, sent on application.

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is the most economical. It is the finest ground cement on the market. For that reason it will take more sand and broken stone than any other cement in existence. To-day our best contractors and engineers consider it superior to any imported cement on the market. We guarantee every barrel of the "Alpha" to be uniform in quality, and to pass any requirement yet demanded of a Portland Cement.

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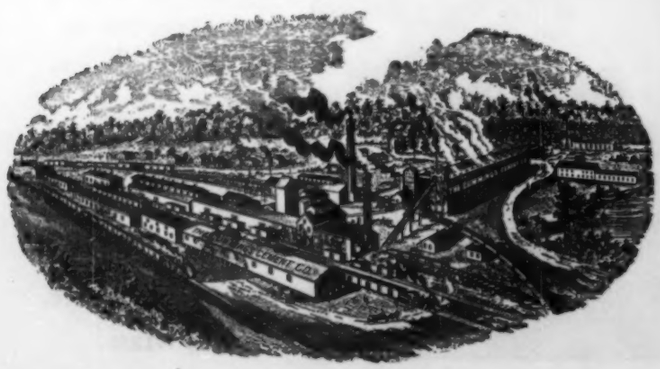

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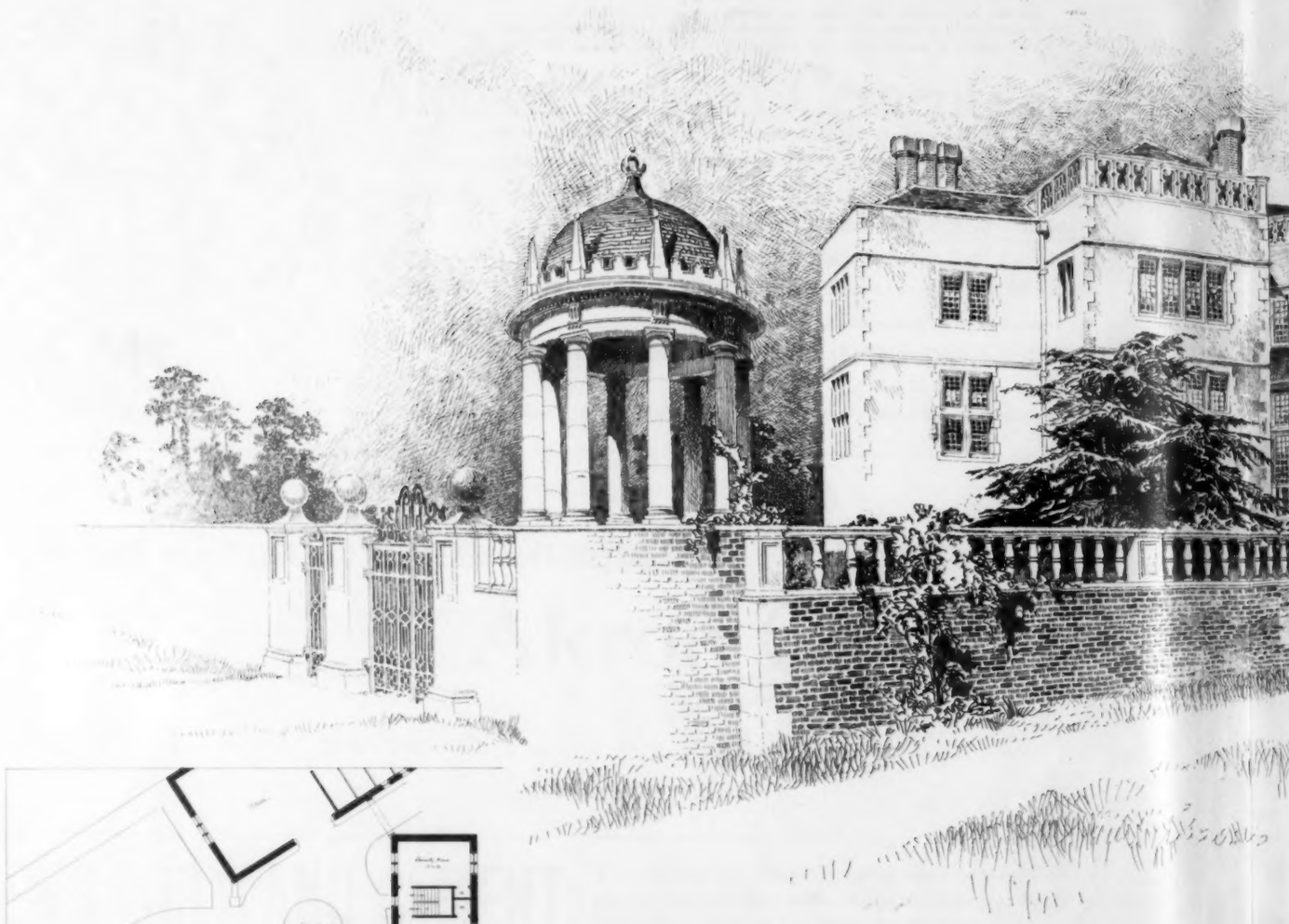
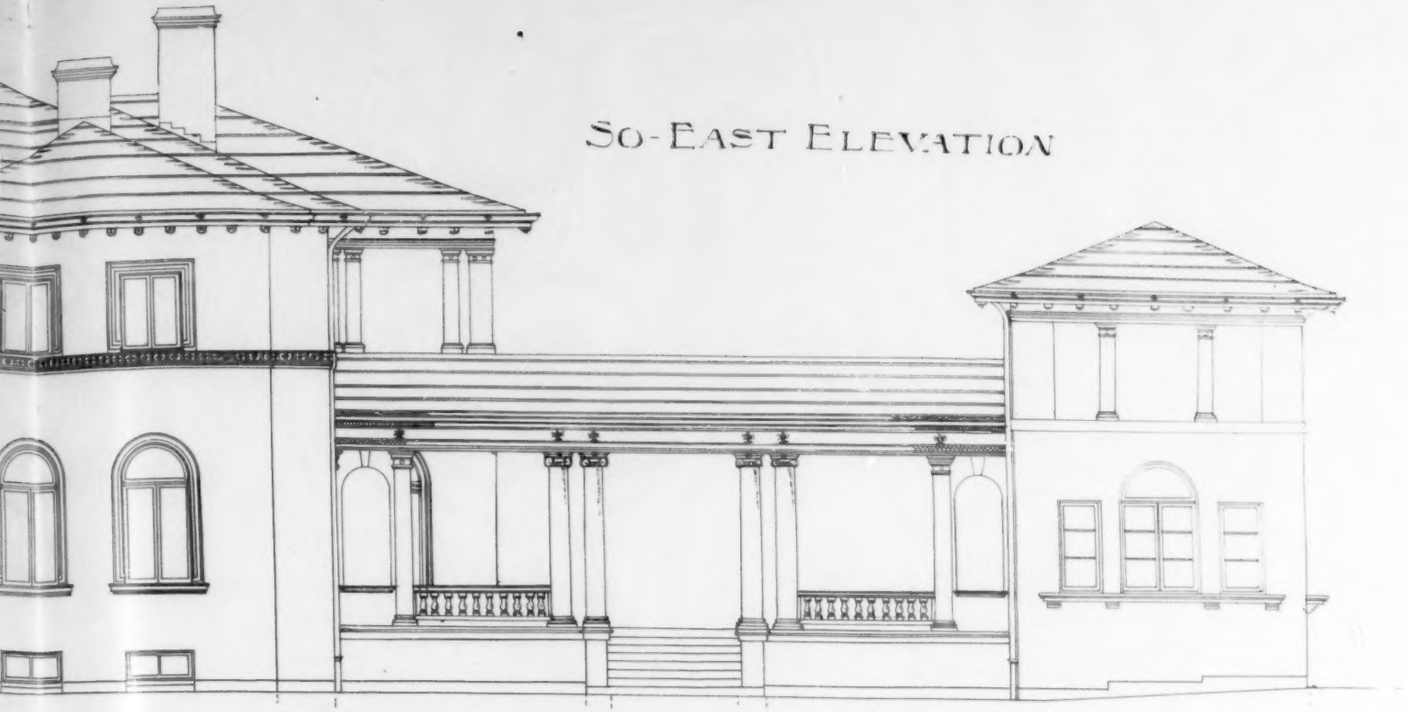


FIRST FLOOR PLAN.

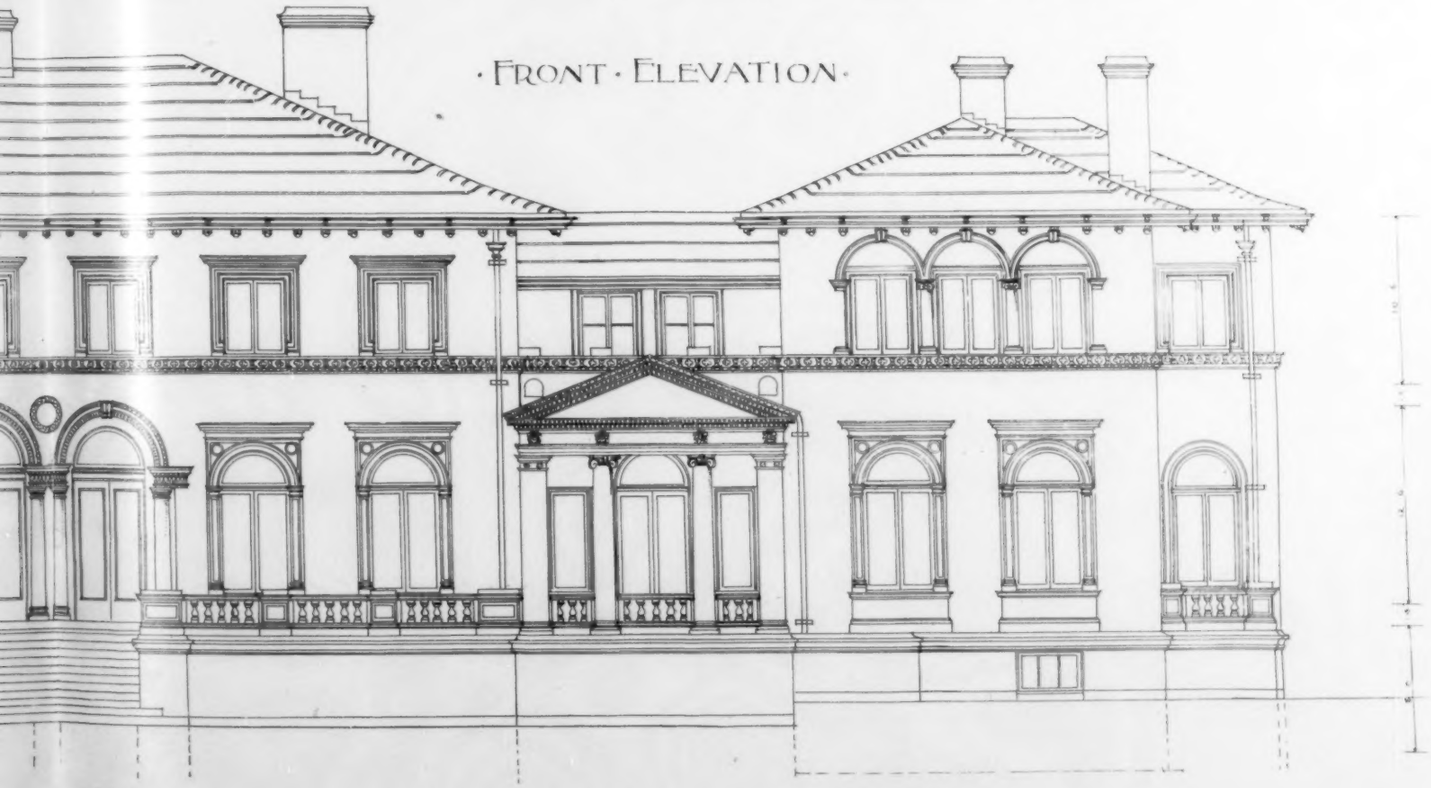
A COUNTRY
CRAM, WENTWORTH &

COUNTRY RESIDENCE.
NTWORTH & GOODHUE, ARCHITECTS.

HOUSE FOR H. H. COOK,
PEABODY & STEARN



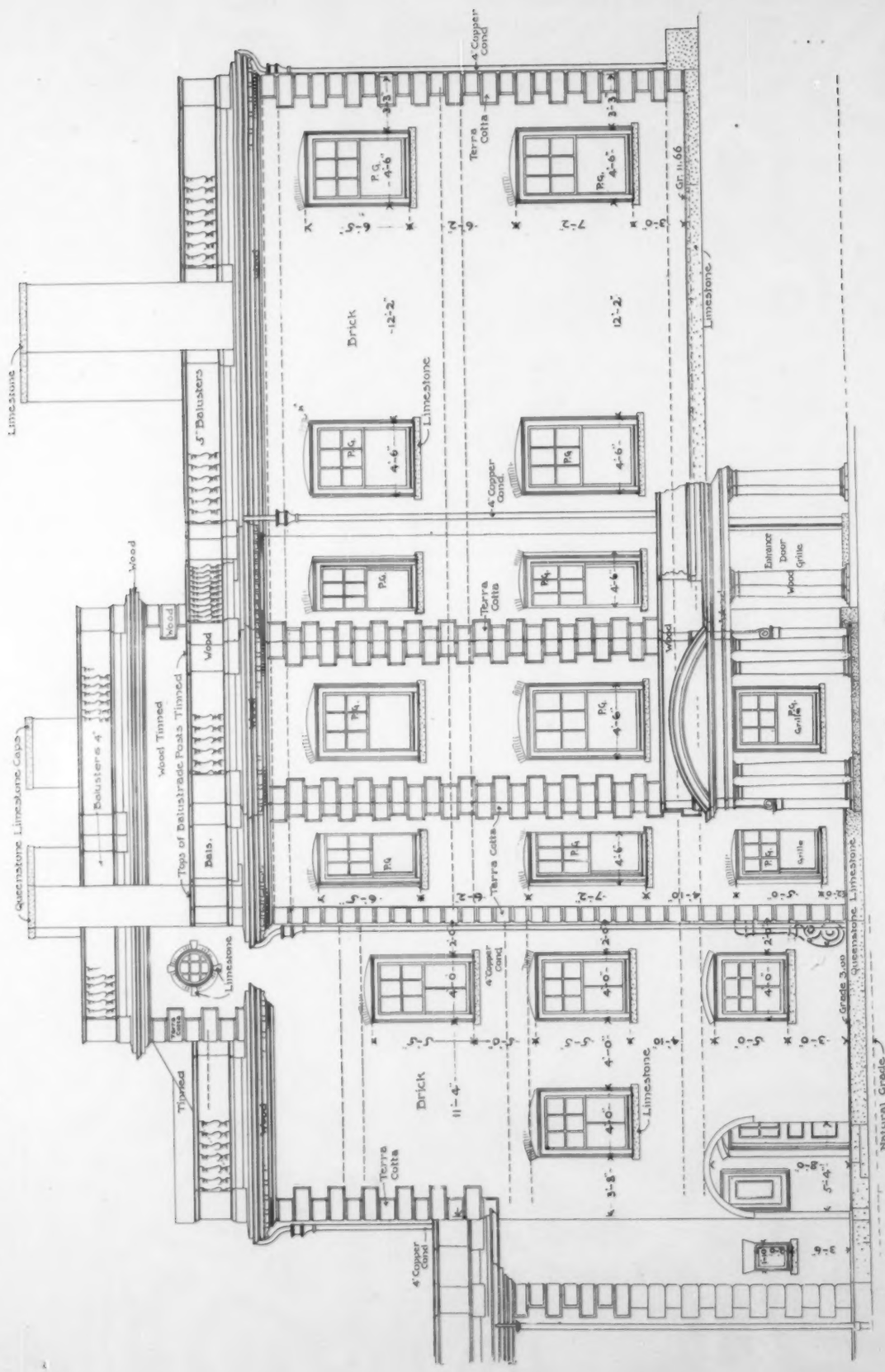
SO-EAST ELEVATION



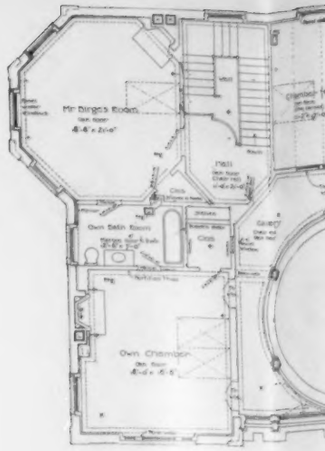
·FRONT·ELEVATION·

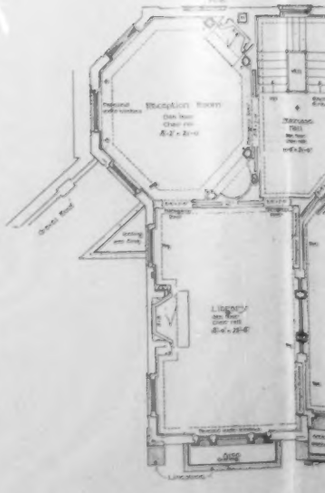
. H. COOK, Esq., LENOX, MASS.
DY & STEARNS, Architects.

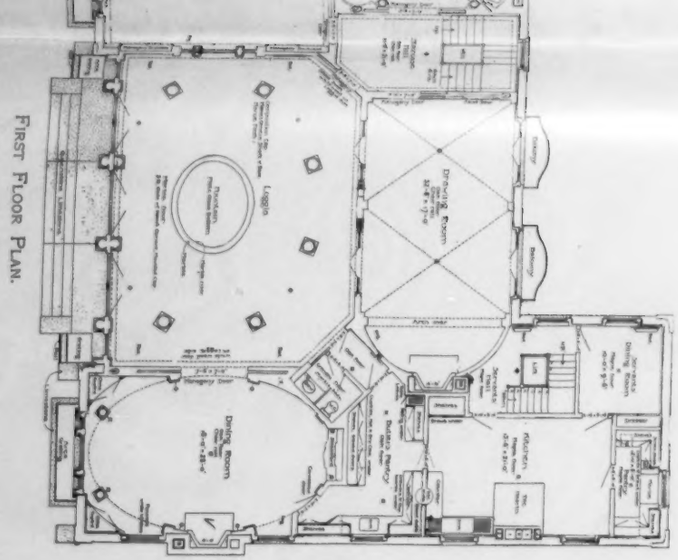
SECOND FLOOR



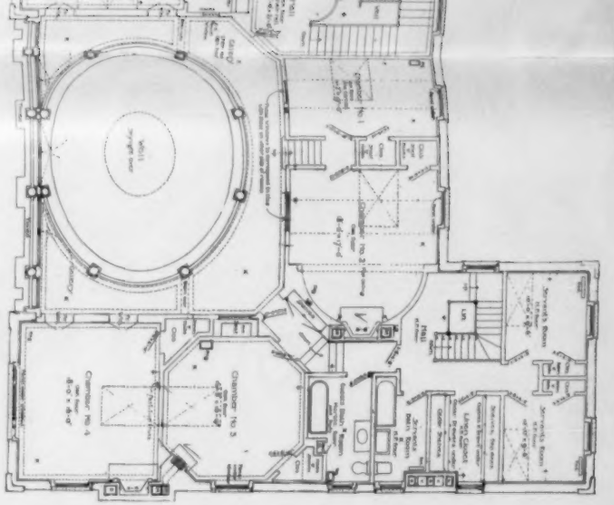
NORTH ELEVATION OF HOUSE.



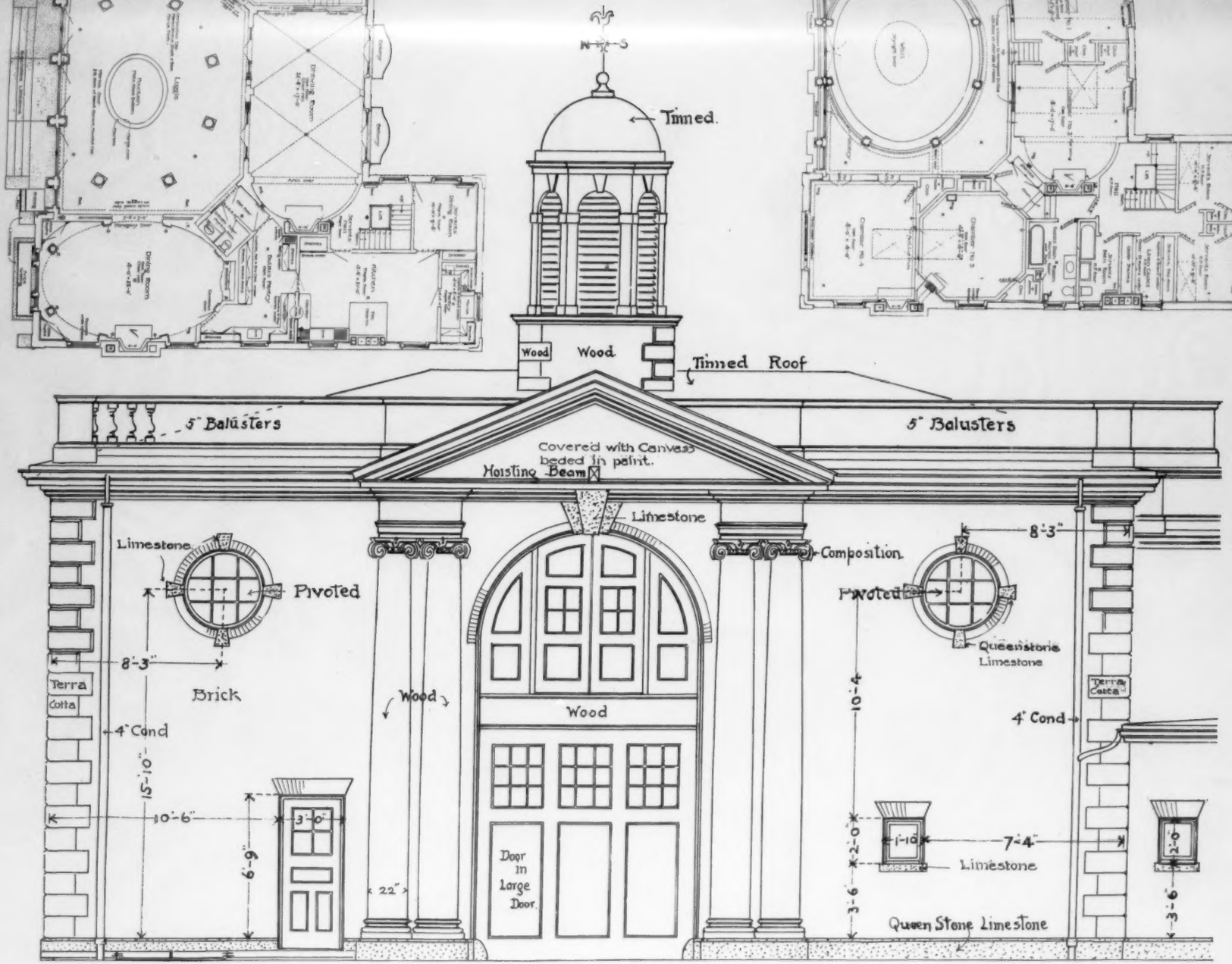




First Floor Plan.



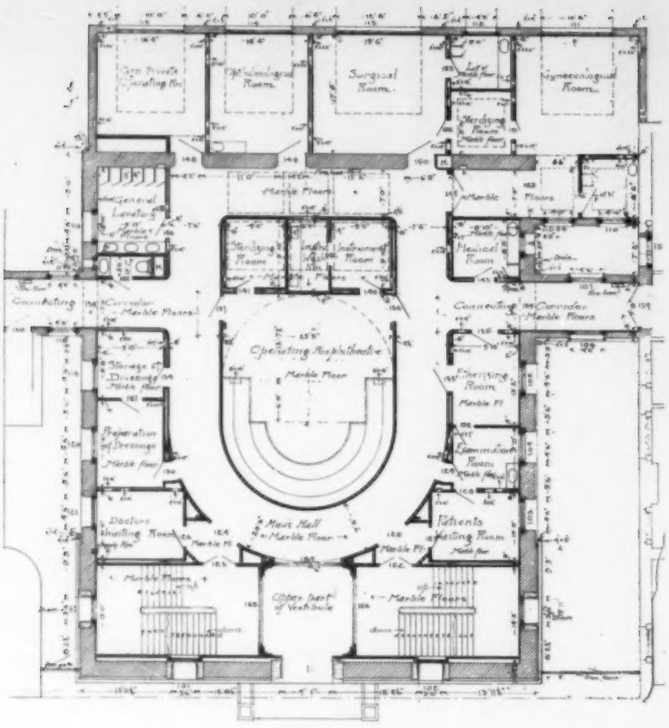
Second Floor Plan.



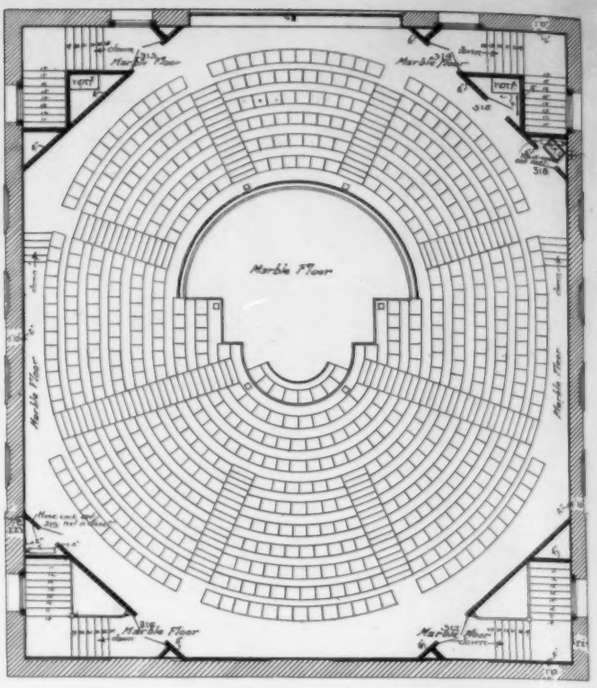
Front Elevation of Stable.

HOUSE AND STABLE FOR GEORGE K. BIRGE, Esq., AT BUFFALO, N. Y.

LITTLE & BROWNE, Architects.



FIRST FLOOR PLAN.

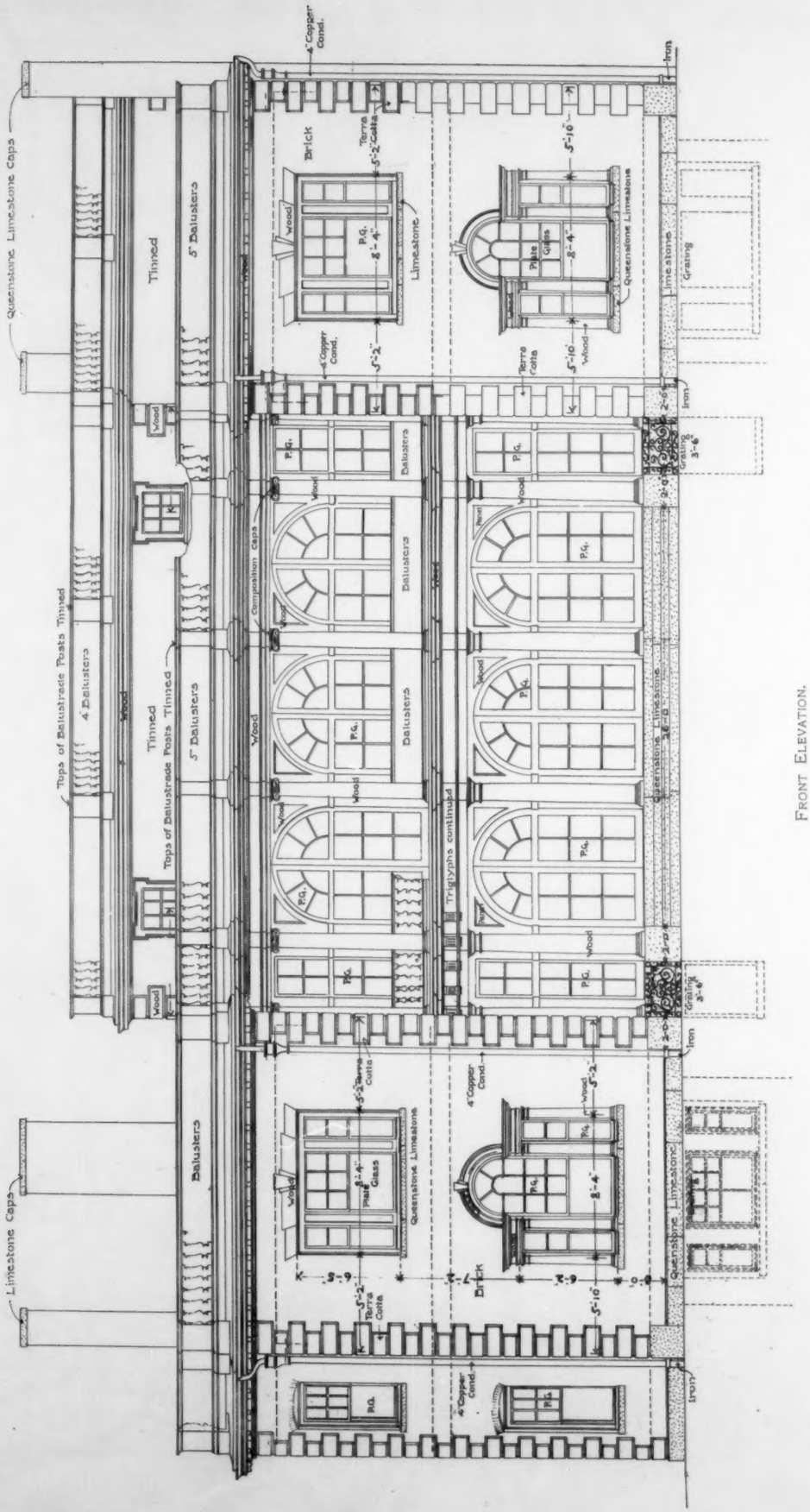


THIRD FLOOR PLAN.

Tile Roof
Three windows of this type to be enriched and panelled as shown here.
Repeat
Second Floor Level
First Floor Level
Tile Roof

CLINICAL AMPHITHEATER, PHILADELPHIA, PA.

FRANK MILES DAY & BRO., ARCHITECTS.



FRONT ELEVATION.

HOUSE FOR GEORGE K. BIRGE, ESQ., AT BUFFALO, N. Y.

LITTLE & BROWNE, ARCHITECTS.

Drawings by Cram, Wentworth & Goodhue.

Plates. { Drawings by Cram, Wentworth & Goodhue.
Drawings by Frank Miles Day & Bro.
Drawings by Little & Browne.
Drawings by Peabody & Stearns.

THE BRICKBVILDER

DEVOTED TO THE INTERESTS OF ARCHITECTVRE IN MATERIALS OF CLAY

PUBLISHED MONTHLY
By Rogers & Manson,
Office, 85 WATER STREET, BOSTON, MASS.

VOLVME SIX
DECEMBER
MDCCCXCVII
NVMBER TWELVE

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To match all colors, brick or stone.

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A HIGH GRADE QUALITY

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Made by Plastic Mud Process.

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The **"SILVER GRAY"** bricks are made from the natural white clay, in combination with jet black imported Manganese, and are the **only** Gray bricks on the market which are **absolutely free** from the very objectionable **yellow tinge.** Test them by comparison.

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These figures, over ten feet in height, were executed in light gray Terra-Cotta for the Smith Building, Market Square, Washington, D. C., Mr. T. F. Schneider, Architect, by

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O. W PETERSON & CO., Agents.

WASHINGTON OFFICE:
Builders Exchange,
WM. C. LEWIS, Agent.

PHILADELPHIA OFFICE:
Builders Exchange,
W. LINCOLN McPHERSON, Agent.

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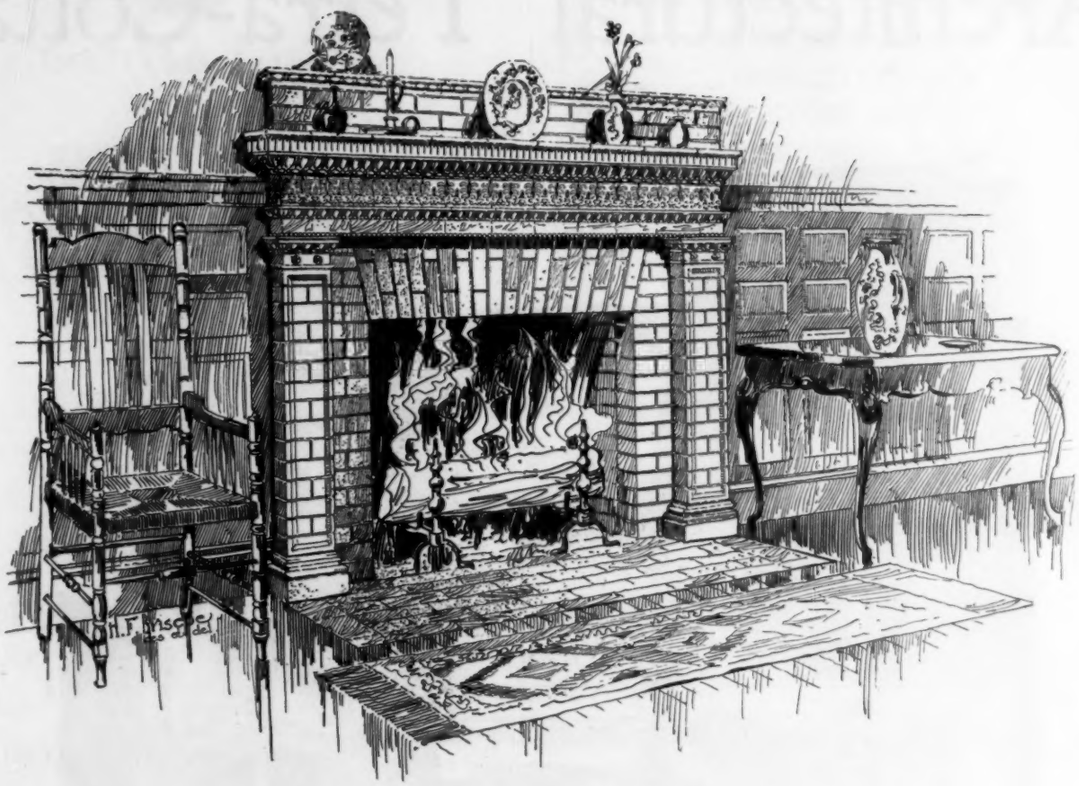

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We are now prepared to furnish an entirely new and complete line of Fireplace Mantels

Designed in classical style to produce rich, yet dignified architectural effects.

Modeled entirely by hand in the highest perfection of the art.

Pressed with great care to give clear-cut outlines and smooth surfaces.

Burned in a suitable variety of soft, rich colors.

Assembled from standard interchangeable pieces in any desired combination, thus giving a great variety of size and detail with no additional cost.

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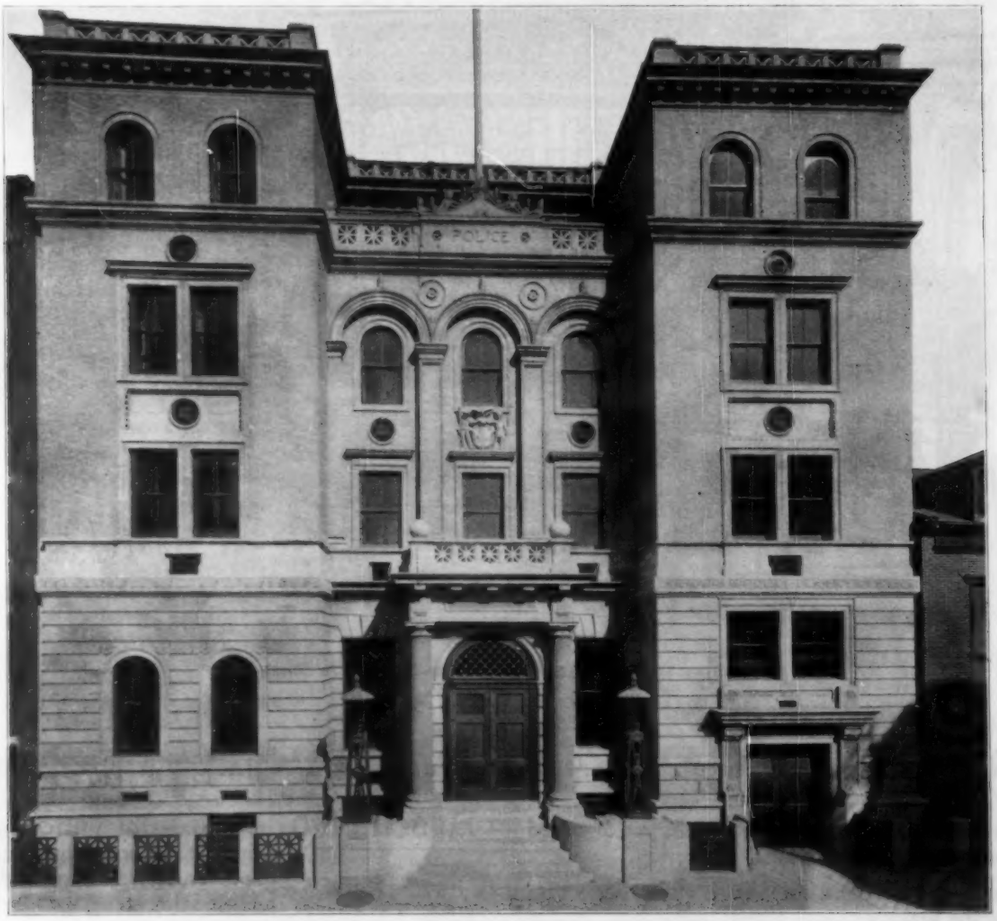

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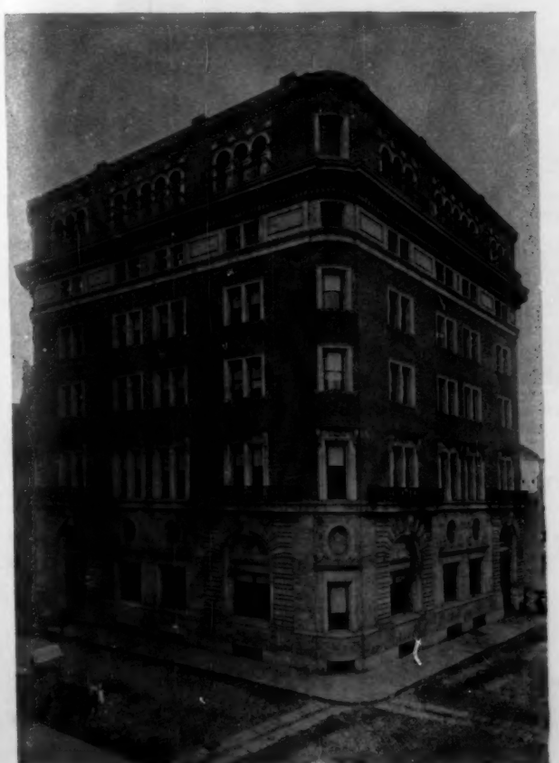

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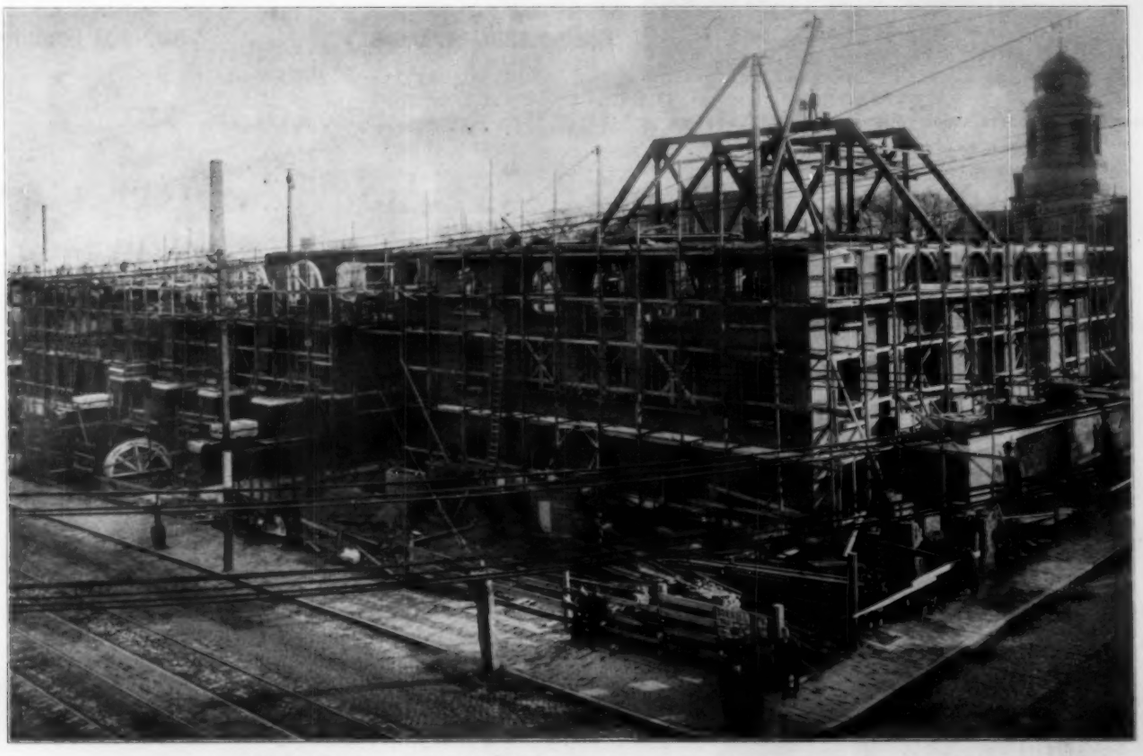

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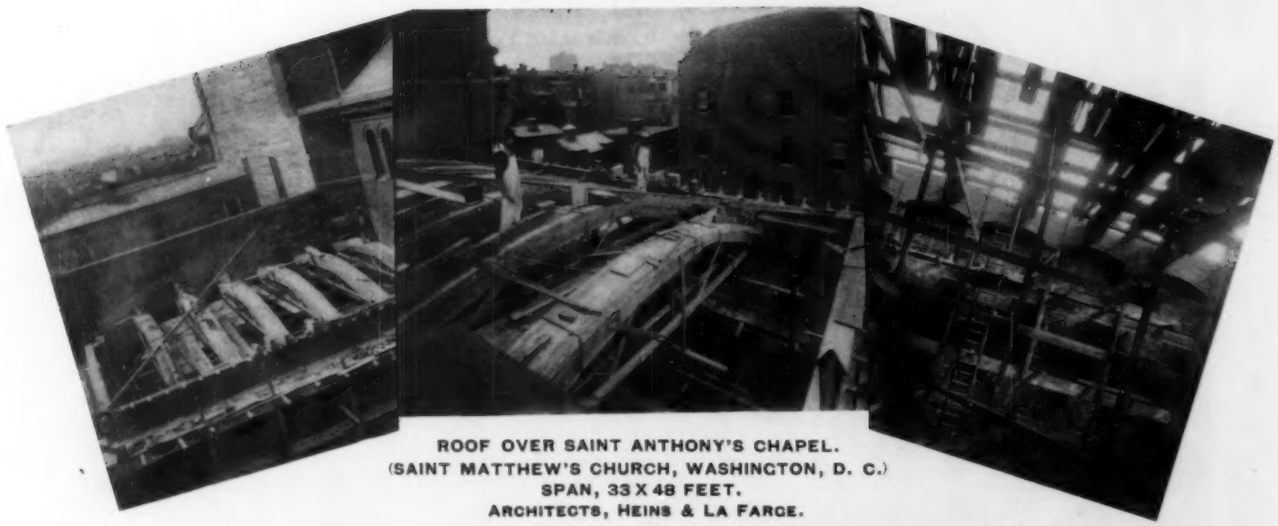

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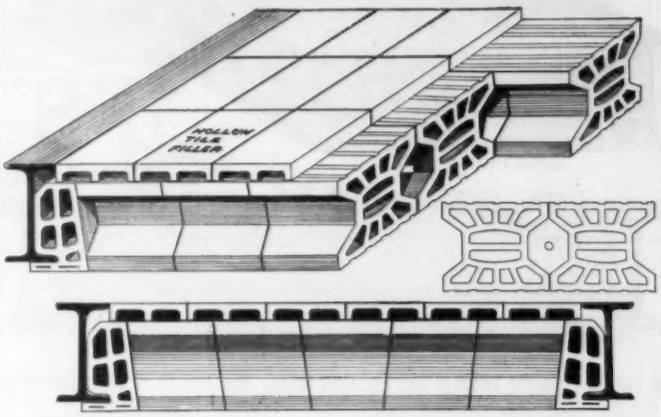

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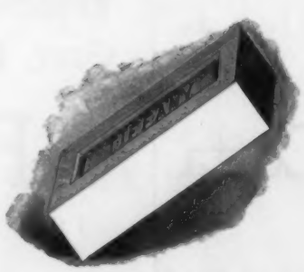

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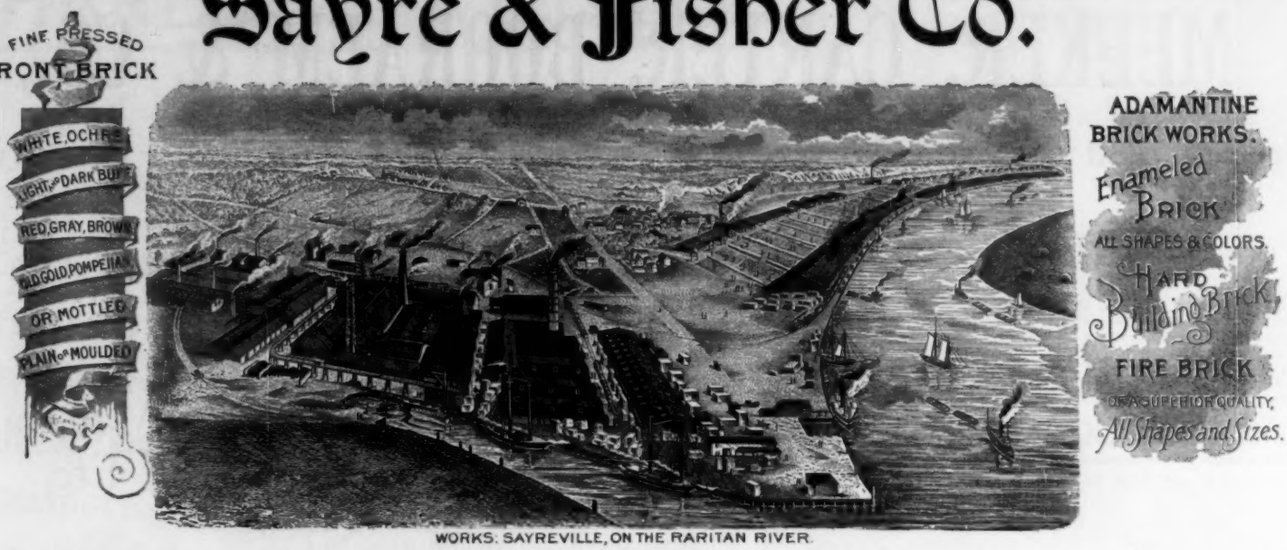

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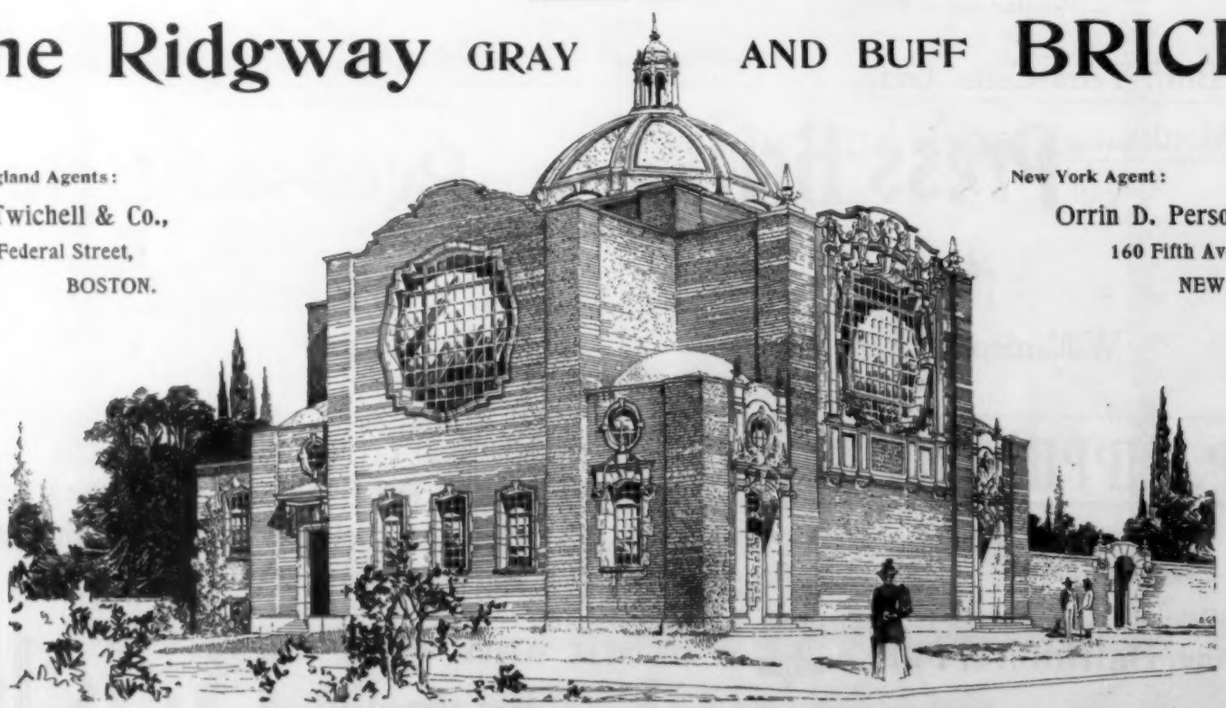

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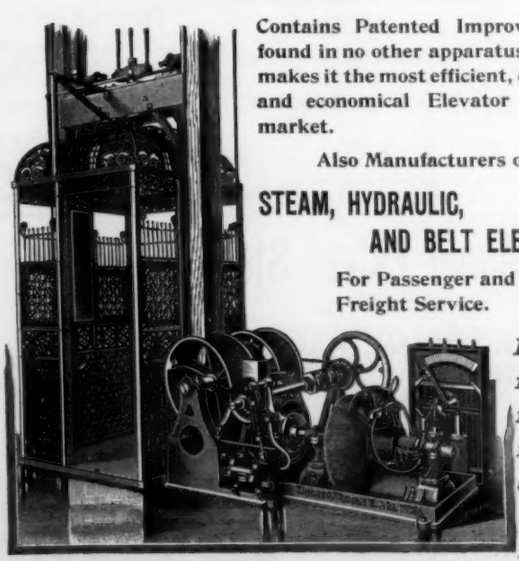

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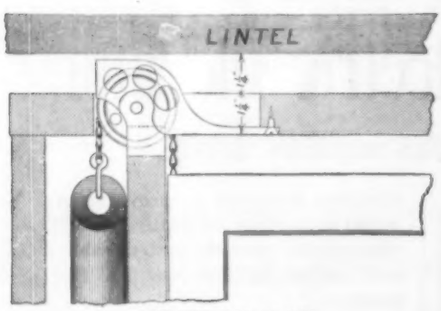

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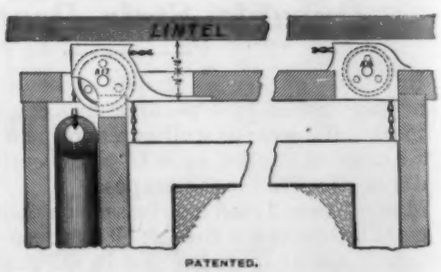

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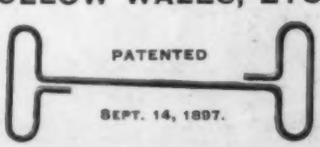

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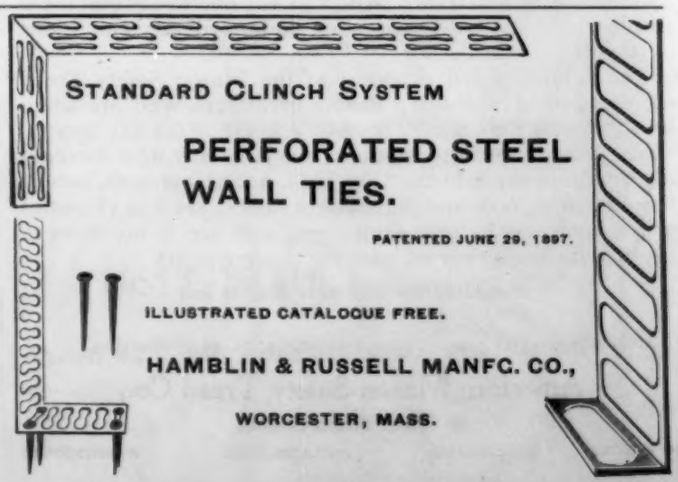

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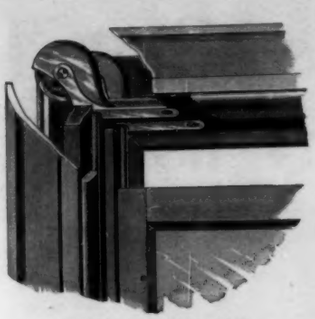

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The Shull Overhead Window Pulley

is the right thing in the right place. No sticking of the sash, no dismounting of the cord when sash is thrown up quickly. 6 to 8 inches more pocket room means a saving in lead weights on short windows. Frame looks better because pulley is invisible.

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for double and triple windows can be put in and taken out after frames are set in position. Saves the pocket room in mullion and gives from 4 ins. to 6 ins. more glass space. It will pay you to investigate.

Folsom Patent Roof Snow Guard.
For Old and New Roofs, Slate, Shingle, and Tile.
The Folsom Method is scientific and is displacing the Guard Rail.

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Brick Plant and Clay Farm in Sayreville Township, Middlesex Co., N. J., on Raritan River, about 3 miles above South Amboy. 282 acres rich deposit of Terra-Cotta, Fire, Red, Blue, and Buff Brick, and Common Clays. Facilities for shipping by Water or Rail. Fully equipped Factory, Dwellings, Office, Store, etc., etc. For further particulars apply to W. C. Mason, 272 Main St., Hartford, Conn., or W. Mershon, Rahway, N. J.

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The best equipped Pressed Brick Plant in State of Ohio. Brick have a standard reputation. Finest beds of Red and Buff Clay right at the works. Six Down Draft Kilns, holding 800,000 brick. Daily capacity of presses, 30,000. Steam Dry House. Kilns have Exhaust Fan System, whereby save about $2,000 per annum in fuel. Best coal, $1.00 per ton, delivered at Kilns. Cheap Labor. Belt Line R. R. connects with seven railroads, including B. & O. and Penn. System. Largest line of Molded Dies in the State. Will sell at a great bargain. Correspondence and inspection of plant solicited. Reason for selling, have to move to Colorado on account of health. It will pay you to look this plant over. Address, Lock Box 277, Zanesville, Ohio.

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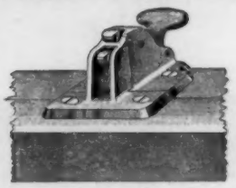
Automatic Safety
SASH LOCK.



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THE advertiser offers, upon favorable terms, a location in Northwestern Pennsylvania, for making Fire, Building, and Paving Brick, Flooring, Roofing, and Drain Tile, Sewer Pipe and Terra-Cotta in all its branches, and in fact all clay products except Pottery. Twelve different kinds of fire-clay and shale in inexhaustible quantities are on the property, burning white, buff, pink, salmon, and red in color. There are also from twelve to fifteen million tons of bituminous coal, which can be delivered at works along the railroad for 50 to 60 cents per ton. Shipping facilities are first class. A set of twelve bricklets, showing color and quality, forwarded on application. One vein six feet thick burns a pure white brick which does not shrink in burning, adapting it especially for making enameled brick and tile. Address, Pennsylvania,

Care THE BRICKBUILDER.

EXAMPLES OF BOND.

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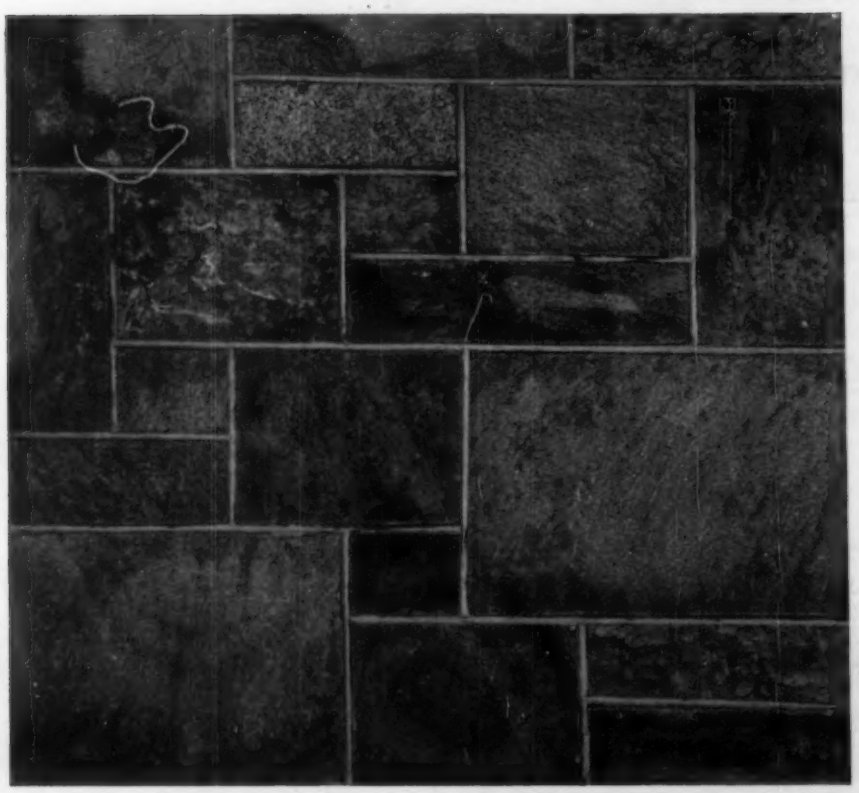
3-Head Bond.

(THE OCTAGONAL QUOINS ARE ACCURATE AND UNIFORM.)



3-Head Bond.

HEIGHTS, MULTIPLES OF 3 INS.
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Lyte Steel and Lead Woven Tread.

This foot tread is intended to be used to prevent slipping and wear on car steps, on stairs, in halls, elevators, railway platforms, on board ship, etc., etc.

This tread is made of steel wire, plain or galvanized, in the warp and lead-coated steel wire in the filling, woven together and rolled down so that the lead fills up the interstices, thereby presenting a lead surface knit together by steel wire which forbids slipping and prevents wear.

This tread is manufactured by the **CLINTON WIRE CLOTH COMPANY, of Clinton, Mass.**

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ranging in daily capacity from 20,000 to 100,000, make bricks with less lamination than other auger machines.

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T. W. CARMICHAEL, Wellsburg, West Va.

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ALUMINA SHALE BRICK COMPANY,
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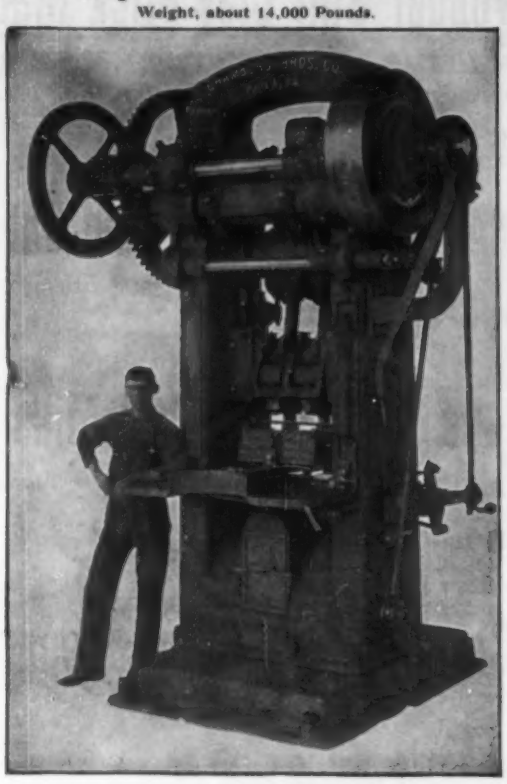
Power Repress for Plastic Brick.

Weight, about 14,000 Pounds.



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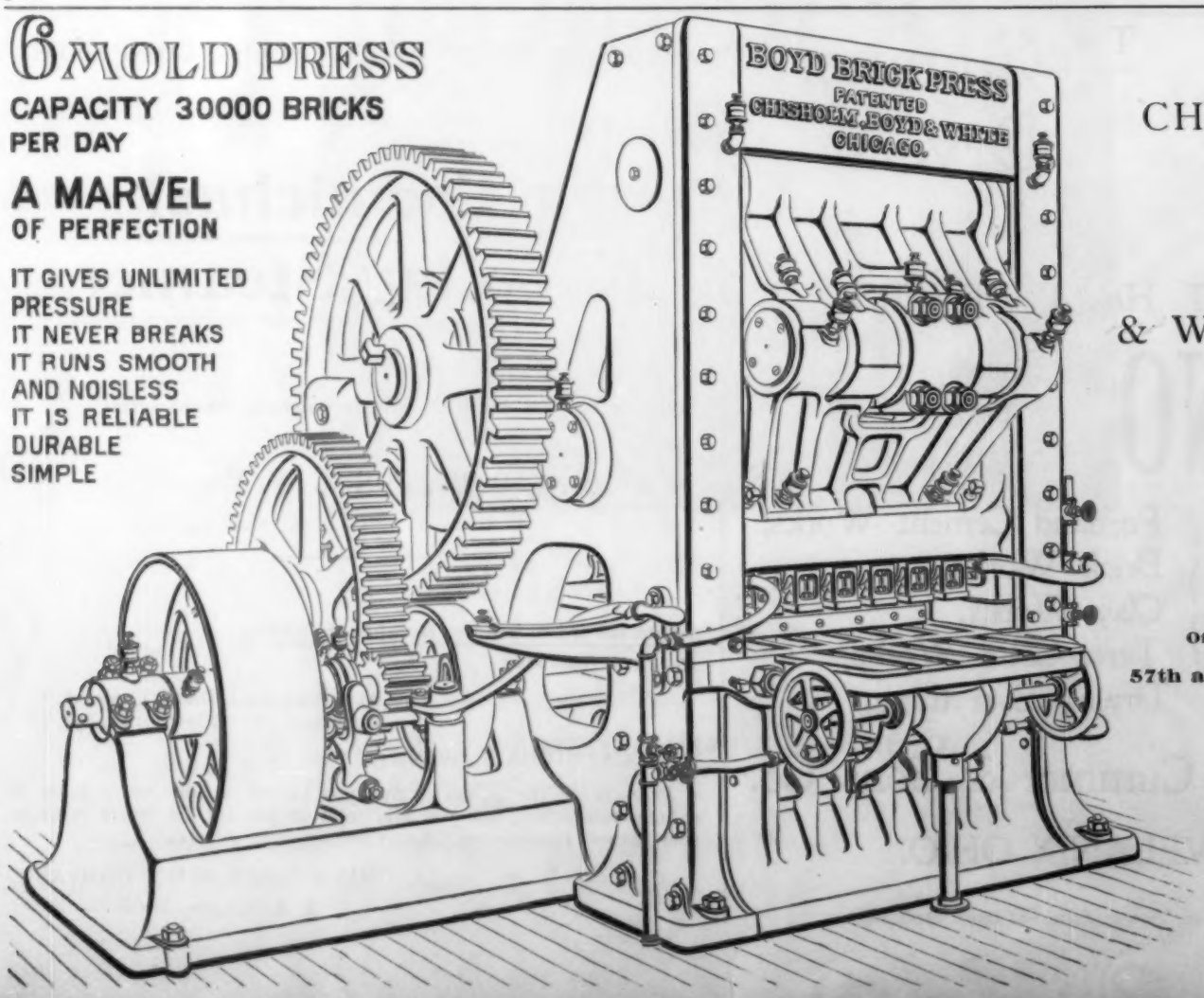

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